FEBRUARY • 1951

WIRE
AND WIRE PRODUCTS

SYNCRO

...IS FULLY MOBILIZED

AID IN MEETING YOUR ADDITIONAL
NATIONAL EMERGENCY
PRODUCTION

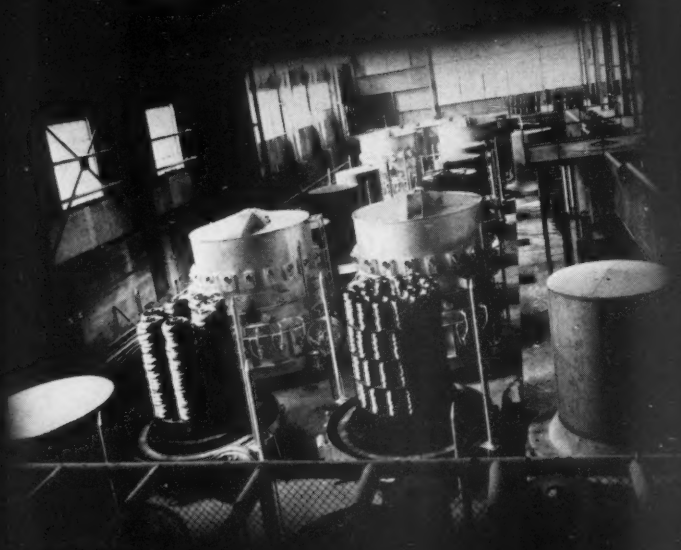
Machinery for the Wire Industry

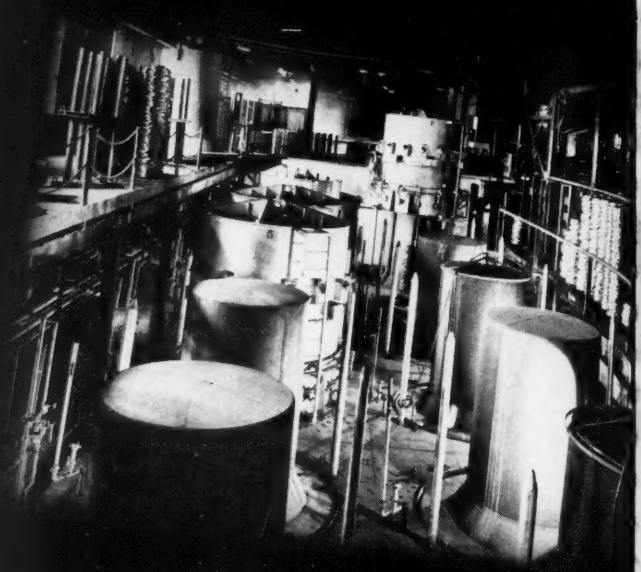
WIRE DRAWING MACHINES • STRANDERS • CLOSERS • TAPERS • PAYOFFS
CABLERS • CAPSTANS • CONTINUOUS ELECTRIC ANNEALERS • RE-SPOOLERS
WIRE INSULATORS • DIE STRINGERS • HEAVY DUTY TAKE-UPS • SPECIAL MACHINERY

SYNCRO MACHINE COMPANY
PERTH AMBOY • NEW JERSEY • U.S.A.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

WILSON WIRE ANNEALING





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A NEW BLENDED COMPOUND WITH IMPORTANT PROPERTIES

Eliminates peeling and causes wire to run well on the blocks.

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This new compound has valuable characteristics for drawing galvanized wire that we shall be glad to tell you about.

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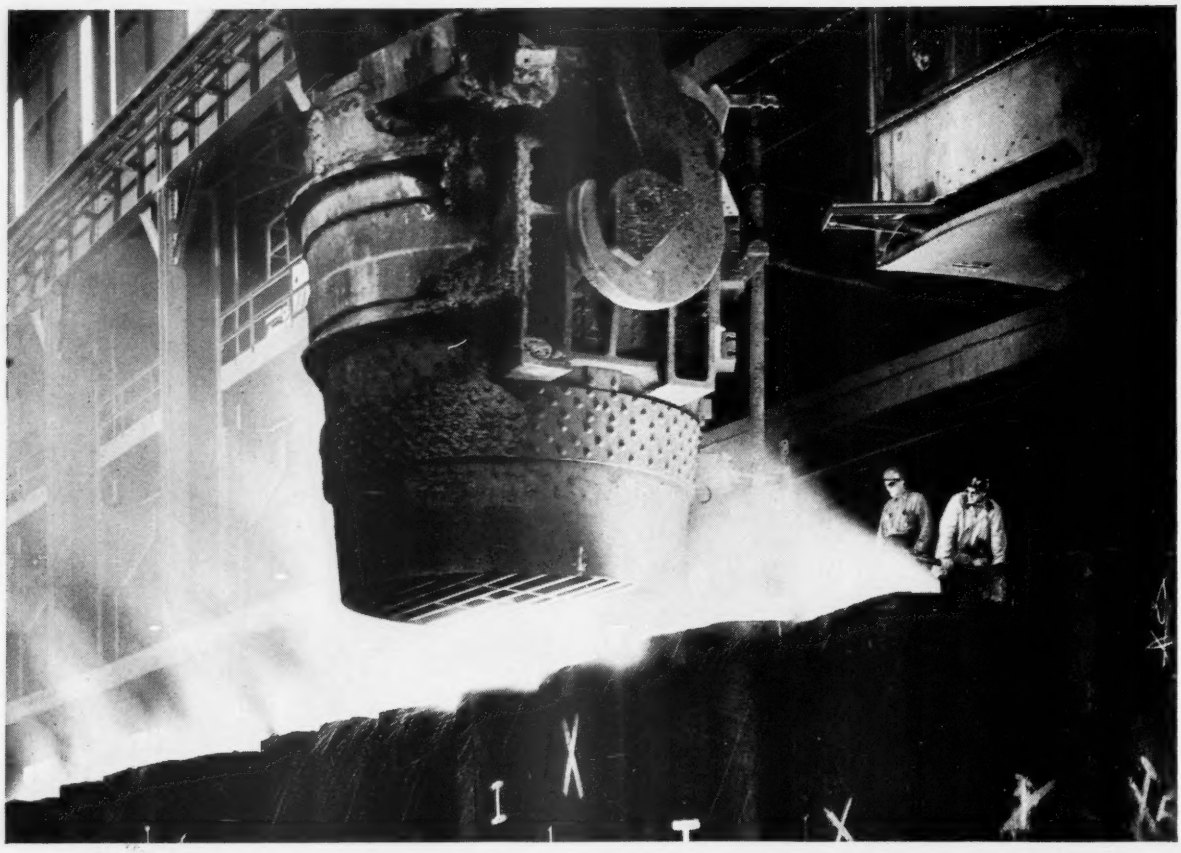


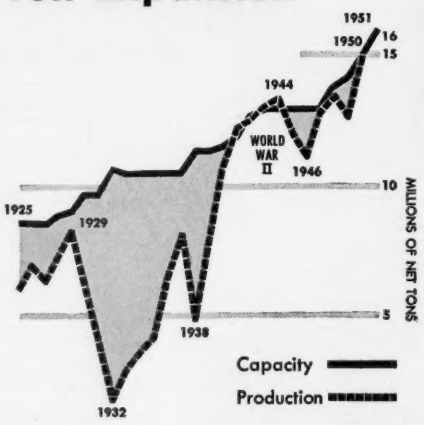
MILLION TONS MORE STEEL

Latest Increase in Bethlehem's Annual Capacity Climaxes 5 Years of Postwar 3,100,000-Ton Expansion

On January 1 of this year Bethlehem's steel making capacity stood at 16 million ingot-tons annually—*an increase of 1 million tons* over a year ago.

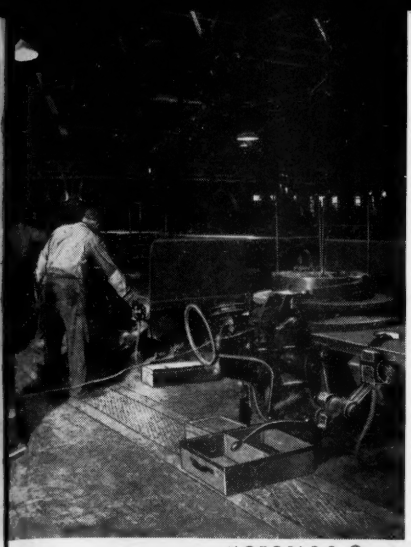
Since the war ended we have increased our annual steelmaking capacity *3,100,000 tons, or 24 per cent.*

Moreover, as the chart at the right shows, Bethlehem's steel capacity has nearly doubled in 25 years. Additional capacity can and will be created as it is needed.



BETHLEHEM STEEL ★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS, Vol. 26, No. 2, February, 1951, Pub'lication Office at Orange, Conn. Executive Office 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Sec'y. and Treas. Subscription price: U. S. $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, at the Post Office, Orange, Conn., under the act of March 3, 1879.



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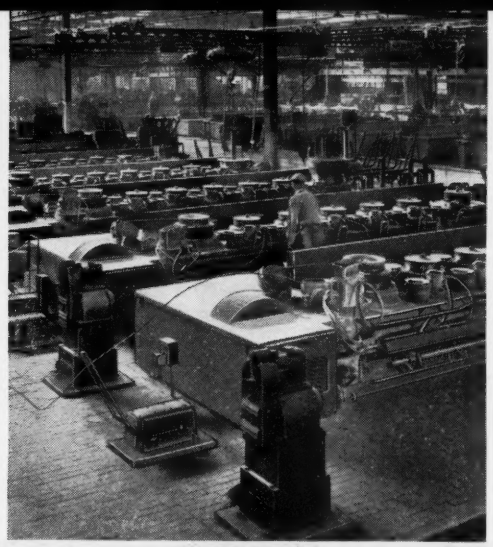

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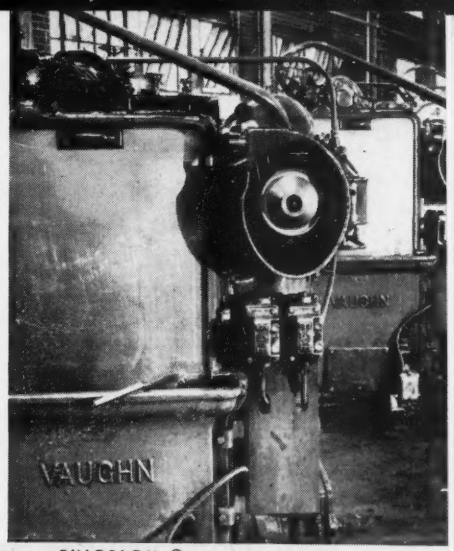

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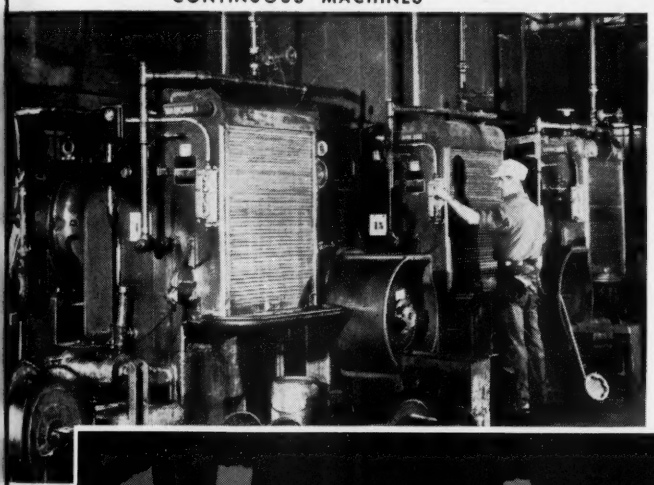
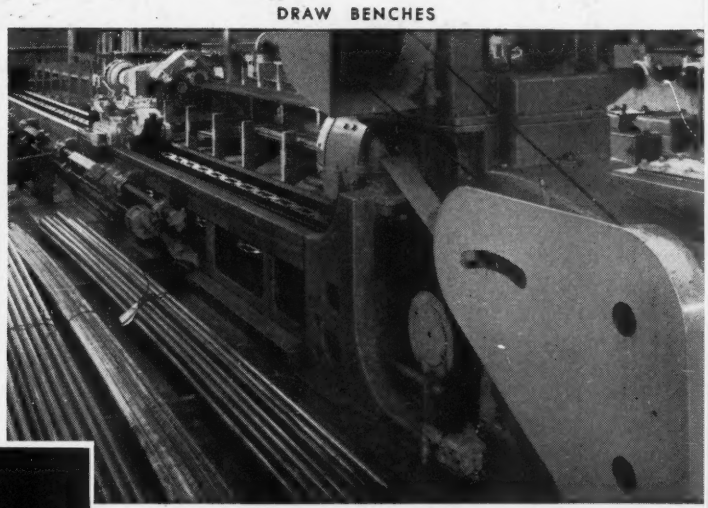


DRAW BENCHES



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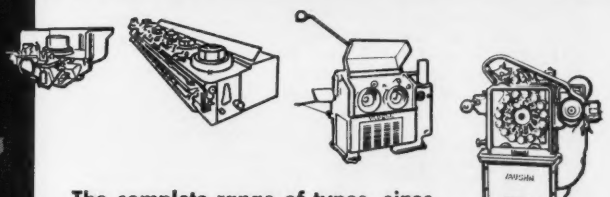

The complete range of types, sizes and capacities covered by Vaughn Cold Drawing Machinery provides the most efficient answer for each of your cold drawing requirements. ● May we arrange for a practical discussion of your needs?

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PROFITABLY USED BY LEADING WIRE MILLS SINCE 1871

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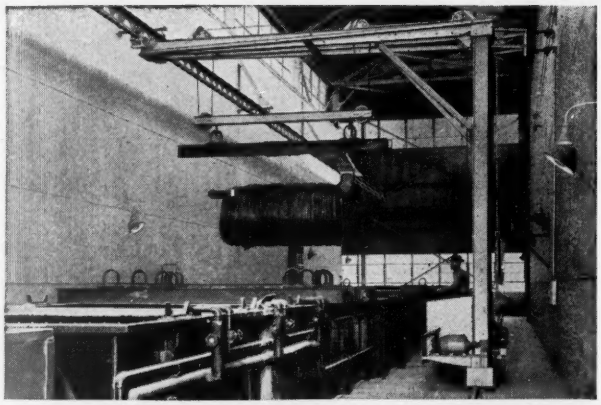
COMPLETE COLD DRAWING EQUIPMENT—Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

MATERIALS HANDLING IN THE WIRE INDUSTRY

Many wire and wire products plants are enjoying the numerous advantages possible with Cleveland Tramrail. They are speeding production and lowering costs by using larger production units, eliminating rehandling and reducing machine "shut-down" time. They are using overhead space to save floor space. They are promoting safety. In many instances they are eliminating need of plant expansion by installing Cleveland Tramrail.

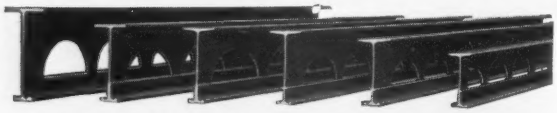


Cleveland Tramrail cleaning house gantry cranes boost production, cut costs sharply and greatly aid health and safety conditions.

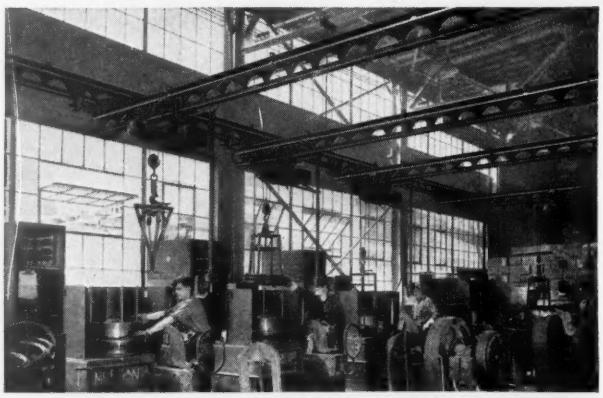
STANDARD ITEMS EASILY COMBINED TO HANDLE MATERIALS OF ANY KIND

Cleveland Tramrail raised-tread long-wear rail.

Cleveland Tramrail consists of standard items such as rail, switches, carriers, cranes, hoists, grabs, etc., which can be combined in a thousand-fold ways to serve nearly every materials handling requirement.

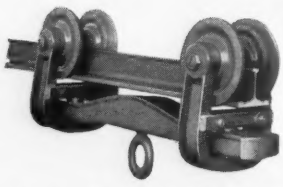


Cleveland Tramrail Archbeam in seven sizes for various loads and conditions.



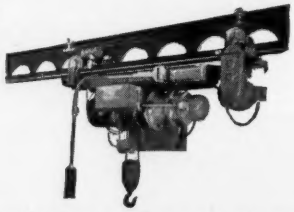
Providing each drawing block with an individual Cleveland Tramrail stripping crane speeds production and brings about sizable savings. Hernia injuries from heavy liftings are eliminated.

30,000 INSTALLATIONS



Hand propelled carrier built for long life and easy operation. Wheels have hardened tread and flange; bearings are double race type.

Backed by experience with 30,000 installations in industries of all types, Cleveland Tramrail representatives are in exceptionally good position to serve you. They will gladly advise, survey your plant, make layout or prepare quotation without obligation.



Motor-driven carrier with electric hoist. One of many types built by Cleveland Tramrail.

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Pittsburgh Oil Tempered Wire is available in a complete size range, either flat or round, in coils or straightened and cut lengths. Also, Pittsburgh hard drawn MB spring wire will be available in a complete range of sizes.
For Oil Tempered Wire and Hard Drawn MB Spring Wire that is uniform in size, finish, mechanical and metallurgical properties, specify Pittsburgh. Write now for information to Department W, Pittsburgh Steel Company, Pittsburgh 30, Pa.
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is diamond lapped and imparts a bright, lustrous surface to parts drawn.
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deep draws the toughest alloys with ease—without pickup, scoring or scratching.
95,000,000 p.s.i. MODULUS OF ELASTICITY
(3 times steel) holds size and tolerance to .0001"—cuts rejects and scrap.
SPECIAL MOUNTING PROCESS
is accurately calculated to withstand drawing pressures—and increases both the transverse and longitudinal strength of the nib.
79 ROCKWELL "C" HARDNESS
(hardest steel—68 "C") of talide nib assures continuous 24-hour production without downtime or maintenance costs.
up to 24" in diameter
ALLOY STEEL CASE
of maximum hardness, strength and toughness gives adequate support and backing to the carbide nib.

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Roebling's is one of the largest specialty wire mills in America and from steel-making to finished product every manufacturing step is performed in Roebling's plants. Today large quantities of this wire are required in the nation's rearmament program, but Roebling will always do everything possible to meet your requirements. John A. Roebling's Sons Company, Trenton 2, New Jersey.

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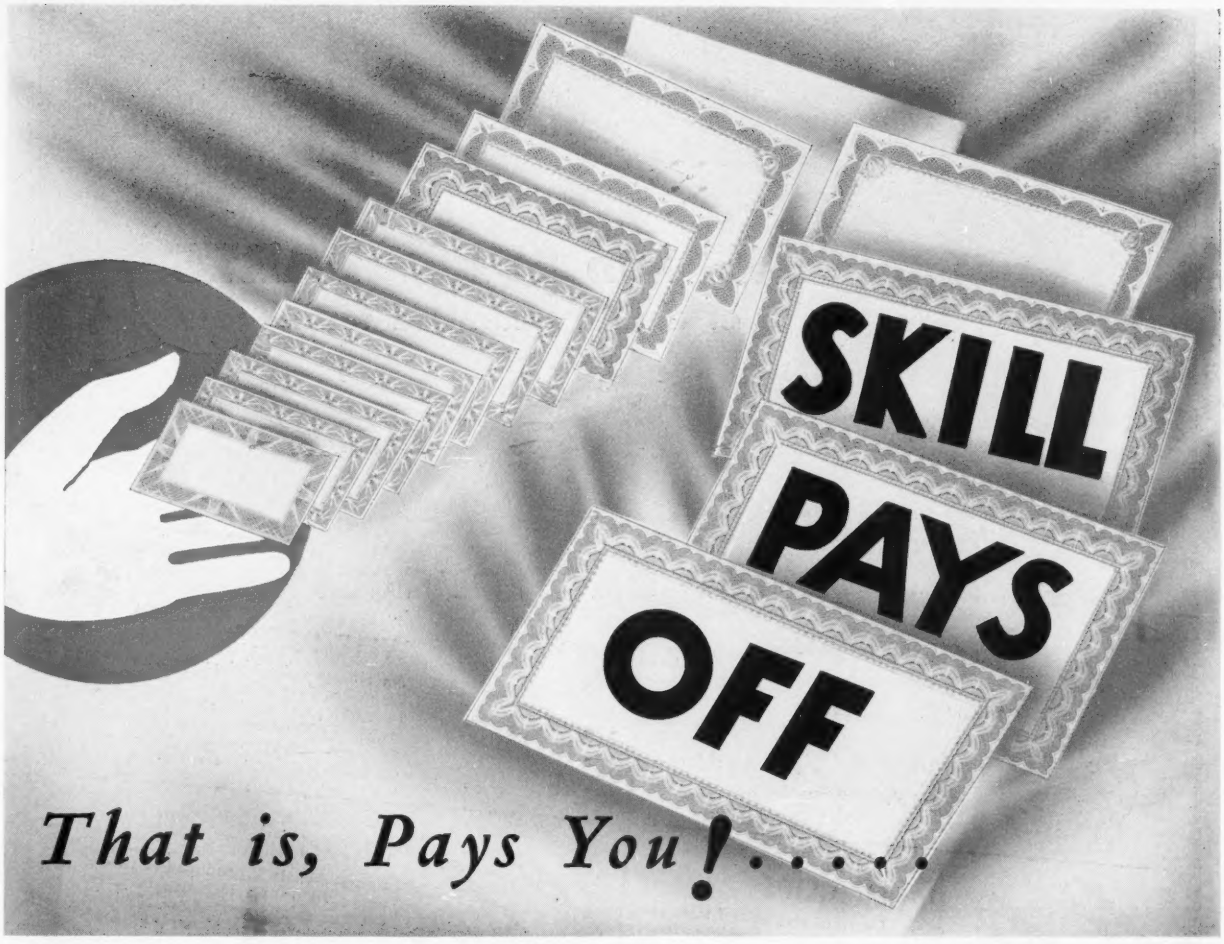

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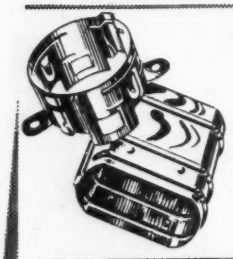
WIRE AND STRIP PARTS
of almost unlimited form

can be produced faster and for less



STRIP PARTS

A wide variety of forms can be produced direct from coiled stock at speeds up to 9,000 parts an hour. Each component is completed in a single passage through the machine, and may save six or seven separate press operations.

WIRE PARTS

An almost unlimited range of wire forms can be produced at speeds up to 9,000 parts an hour. By means of change-parts these machines can be quickly converted from wire to strip forming or vice versa.

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Clips of various shapes and sizes are produced at 180 a minute from coiled stock. It's only a matter of minutes to change the actual tools to produce clips of another shape, or change the complete assembly for a different size.

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Knotted chain is produced at speeds up to 70 links a minute ; mattress chain at an average rate of 120 links a minute ; short link welded chain for ships, cranes, etc., is formed at speeds up to 110 links a minute, and automatically welded at rates up to 60 links a minute (according to size).

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Up to 700 nails a minute (according to size) can be produced on Heenan automatic nail presses. Round nails, oval brads, square, fluted or twisted nails can all be produced with a wide variety of head shapes, direct from coiled stock.

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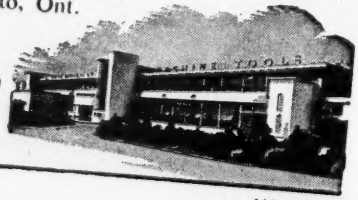

Christendom was saved by steel

ALL day long, waves of Arab horsemen beat upon the ranks of Charles Martel's veteran militia. But time after time, the enemy cavalry recoiled before storms of iron-tipped javelins, their shining scimitars unsuccessful. On the second morning, the Saracen leader, Abderrahman, was slain, pierced with many spears. The Moslem horde fled back across the Pyrenees, never again to menace the Western world.

Time after time, as at Tours in 732 A.D., Christian civilization has been threatened by seemingly invincible enemies. Yet history proves that victory invariably has gone to the nation or alliance which excelled in the production and use of iron and steel.

In the present era of alarms and crises, it is reassuring to realize that America has greater capacity for making steel than all the rest of the world combined. Furthermore, the American steel industry is expanding at a rate far faster than that of all the dictator-directed economies behind the Iron Curtain. Our free and independent steel making and metal working industries can and will forge sinews for the peace we want or for the war we may be forced to fight.

So remember this: It is not only the threat of Muscovy to fear—America has itself to fear also—its misguided sentimentalists, its sheltered saboteurs—who seem to play communism's game by frittering away our strength and our resources.

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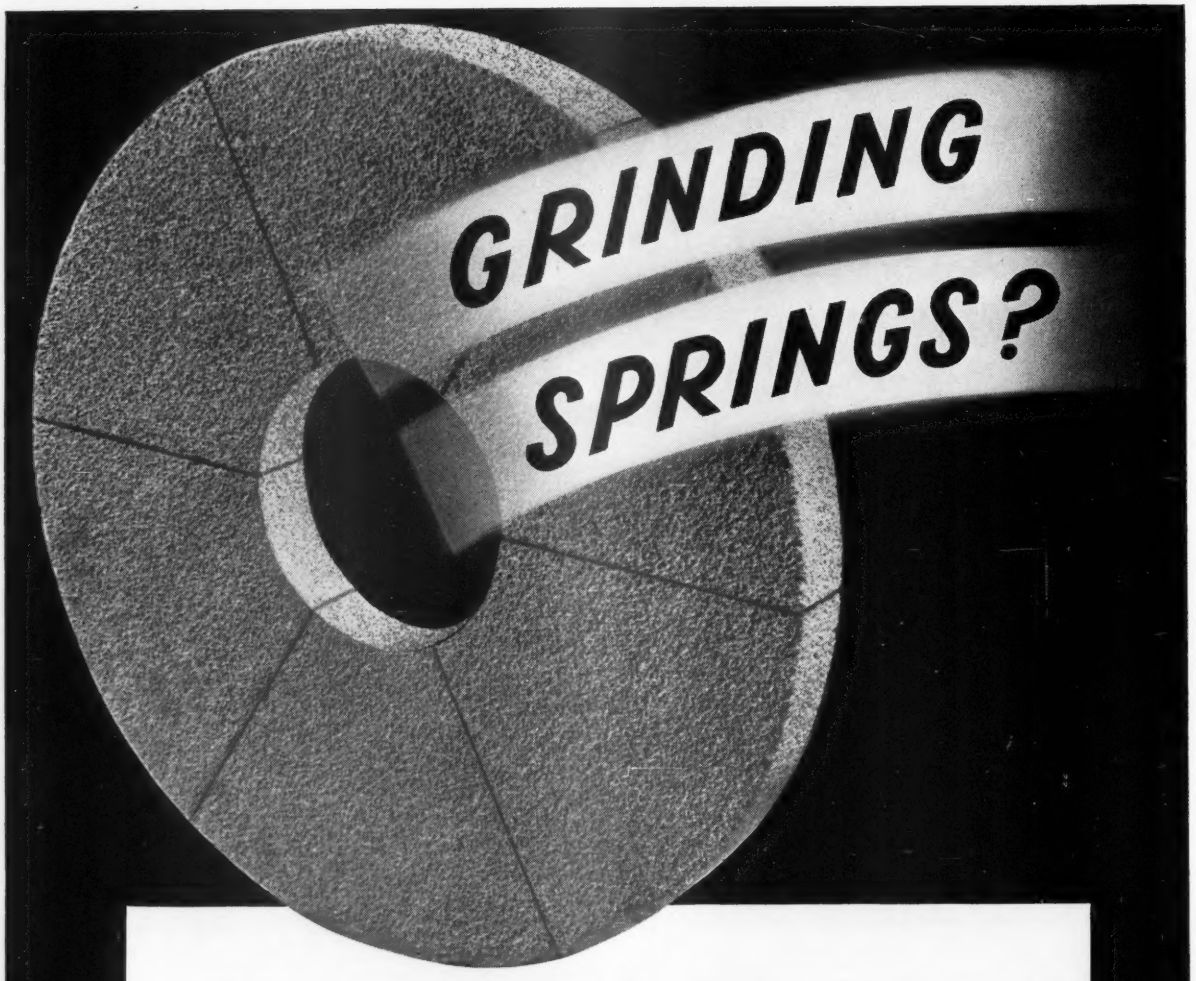

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To cut costs on your alloy steel grinding jobs, try discs of tough, sharp 57 ALUNDUM abrasive (suggested specification—57A246-L11VBEP). And for best results on critical stainless steel grinding jobs there's a special cool-cutting Norton abrasive. Norton Discs are available in all standard sizes (15" to 72" in diameter) and with all types of mountings.

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Making better products to make other products better

NORTON
ABRASIVES

THERE'S A REASON WHY

MORE WHEELS SPIN WITH STEELSKIN THAN EVER BEFORE!

Above you see Walter A. Smigel, general manager, pointing out to, left to right, Randolph V. Miller, President of R. H. Miller Company, Inc., A. J. LeBlanc, sales representative and Dr. H. Grey Verner, director of research, the vast 1950 increase in STEELSKIN mills throughout the country. An even more spectacular increase in STEELSKIN use is already shaping up for '51."

THERE'S A REASON.

IT'S SIMPLE. IT'S THIS:

Alert steelmen everywhere have learned that STEELSKIN *personalized* research — tops in the field for over 40 years — pays AND PAYS —AND PAYS—in *lowered* costs, *increased* efficiency, *better* wire. Write, phone or wire, and a STEELSKIN research expert will be at your service.

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are used for conductor

insulation covering

on plastic barn wire?

FIBERGLAS *Yarns*

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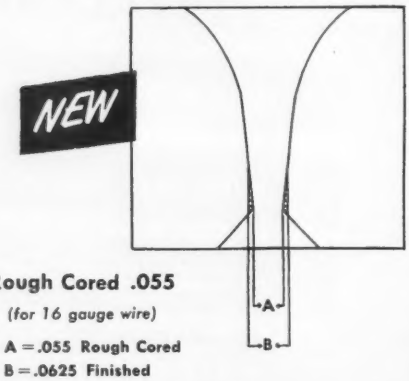

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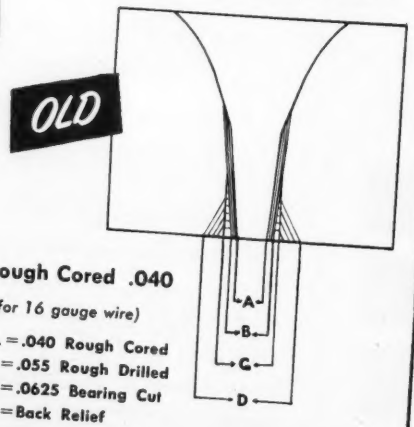

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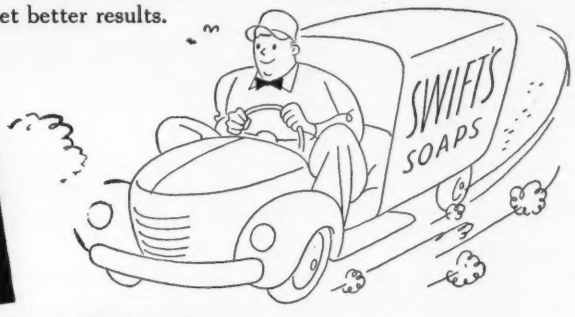

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The Wire Outlook

The screws of war controls are tightening a lot faster than expected a month ago. War orders are beginning to flow out in large volume and are becoming big business. No one can foresee the future, but we are most assuredly putting ourselves in a position to meet the threat of a major war if it comes—which God forbid! Voluntary price controls have proven a flop and both heavy taxes and all-out controls seem a certainty.

What rankles is the business-as-usual attitude among polititians. There is no sign yet that our own Federal house is to be put in order and all Government activities not bearing directly on rearmament dropped. Were this done, enough billions could be saved to lighten the coming tax burden considerably. Writing your Congressman demanding economy is very much in order.

Steel producers are in the midst of the greatest expansion in their history and from 1947 to 1952 will have added nearly 20 million tons to the nation's capacity.

The stockpiling of copper is believed by some to need some revision. Industry consumption averaged 118,000 tons per month in 1950 against 88,000 tons per month in 1949. Domestic non-war consumption has been rolled back to 100,000 tons. Since nearly 50,000 tons are imported and 90,000 tons produced here each month, there will be about 40,000 tons being stockpiled. Presumably it will be fed out again for war material as needed.

Last year for the first time in many years, our imports have greatly exceeded exports, In fact, foreign markets, at our prices, are fast dwindling, although it is healthy for our overseas neighbors to have us on the paying end and thus work out some of the unfavorable balances that contributed so much to dollar shortages abroad. This condition is much better for all concerned than Marshall Plan handouts.

Plastics for wire insulation will continue to be short through 1951, largely as a result of last year's six month strike among chlorine suppliers, although another contributing factor was the greatly expanding use of vinyl resins. The building of new production facilities and high production schedules will, it is hoped, gradually narrow the span between demand and supply.

Most wire mills are booked well ahead into 1951 with the bulk of shipments going into regular consuming channels. DO orders, however, are increasing. The mills have little prospect of improving supply conditions in the coming months. Automotive demand continues high, in spite of cut-backs and other shortages. Screw manufacturers are drawing less wire, since it has been easier to get the finished wire than the rods. It will take some time for a balance to be struck between war and civilian uses of wire. Certain types, especially for agricultural uses, will doubtless be carried on as a necessity.

Adequate supplies of industrial diamonds seem to be assured, compared with the low stocks that were available at the time of Pearl Harbor. Die stones are expensive today and will be used only on wire types and sizes that make diamond dies necessary.

The best advice to everyone is to keep on keeping on. Try to buy what you need. Face difficulties when you meet them and be adaptable to whatever requirements may be forced upon us. All regulation hurts, but more in anticipation than in realization. We have a job to do!

—from the Editor's Desk

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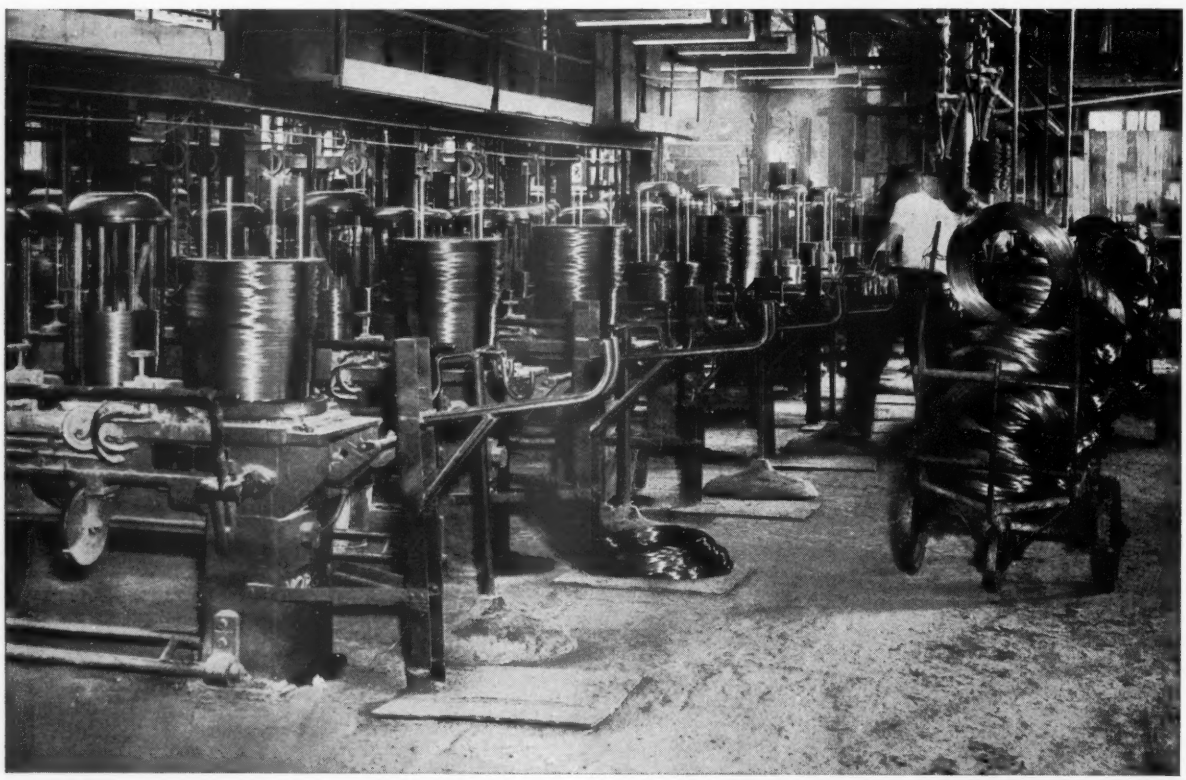

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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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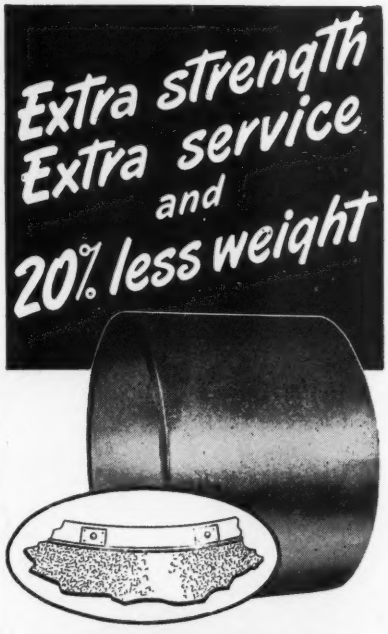

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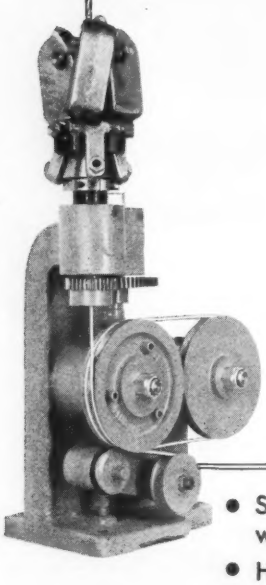

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Vol. 26 FEBRUARY, 1951 No. 2

"Surface Active Agents and Pickling Brittleness"*

by Carl A. Zapffe
and M. Eleanor Haslem
Baltimore, Md.

Summary

Continuing a series of researches on the embrittlement of steel caused by absorption of hydrogen during acid pickling, the present study considers the effects of bath additions other than pickling inhibitors—specifically the so-called surface active agents—also a foaming compound. Measurements of bendability using the specially designed wire bend test follow quantitatively the changes produced by each reagent, used alone and in combination with inhibitors in a standard 10% H_2SO_4 bath.

★ ★ ★

Both carbon steel (SAE 1020) and stainless steel (AISI 440-C) are studied. The surface active agents, fourteen in number, represent anionic, cationic, and nonionic groups, the last containing a series of polyethylene oxides of increasing molecular weights from 200 to 6000, since molecular weight is found to be an important factor. Two inhibitors are chosen to provide standard inhibited baths, one representing a type which characteristically aggravates embrittlement, the other being a specially developed reagent designed to minimize hydrogen embrittlement.

★ ★ ★

From the various behaviors of these reagents and their combinations, conclusions are drawn which add some further description to the commercially important "pickling brittleness".

★ ★ ★

The authors' fine previous treatises on the subject of hydrogen embrittlement are here further extended as a result of additional research into this most interesting, yet often baffling question. As long as acid pickling is used, we shall have the practical problem of overcoming its effects, and only through an understanding of what takes place in the process of using acid, may we hope to achieve this end.

Introduction

Several years ago the authors designed a special bend-testing machine for studying the effects of hydrogen in steel using 1/16-in. wire bent at a constant rate of 5 degrees of arc per second around a 1/16-in. pin in a single bending operation up to 180 degrees[1]. A single bend and a constant rate of bend were chosen in preference to other methods because of the fact that the escape of hydrogen occurring on the tension side of the specimen during stressing alters the original condition of embrittlement.

★ ★ ★

With this test, both pickling and electroplating processes have now been studied in much detail, from the standpoint of hydrogen embrittlement of both carbon steel and stainless steel[2, 3]. A most important discovery of the research on pickling was the **increased** embrittlement caused by virtually all commercial pickling inhibitors when added to acid pickling solutions for stainless steel—regardless of the inhibition of metal attack[4].

★ ★ ★

While carbon steels were found to be less anomalous in their behavior, their degree of embrittlement nevertheless often failed widely of conforming to the degree of inhibition of metal attack. Apparently the physicochemical conditions in molecular surface layers during acid pickling are distinctive in a manner yet to be discovered,

*From research conducted in the Laboratory of the senior author under joint sponsorship of the Office of Naval Research and the American Chemical Paint Company.

for the addition of an inhibitor causing a great decrease in total hydrogen often simultaneously greatly increases embrittlement over that caused by the raw acid.

★ ★ ★

Further exploration of these unexpected phenomena in the acid pickling of steel is warranted for both theoretical and practical reasons. The present study therefore extends the research to a consideration of those surface active agents sometimes added to improve pickling conditions. The primary purpose of the study is to provide at least a preliminary outline for the behavior of these special chemicals in the pickling bath, so far as hydrogen embrittlement is concerned; but there is the added interest of a search for a reagent or combination of reagents which will inhibit hydrogen absorption during the pickling of stainless steel. The study to date remains almost without a clue to the remarkable and persisting sensitivity of the hardenable stainless steels to hydrogen embrittlement, even in strongly inhibited baths.

★ ★ ★

Table I

DESCRIPTIONS OF SPECIMENS

Type	Composition (Wt.%)	Thermal Treatment	Mechanical Treatment
AISI 440-C	Cr = 16.79 C = 1.01 Mo = 0.56 Ni = 0.23 Si = 0.49 Mn = 0.42 S = 0.020 P = 0.021	Annealed: a) 1550°F. for 3 hrs. b) 50°/hr. to 1200° c) Air cool	Cold-drawn: 24.5% red. area
SAE 1020	C = 0.25 Mn = 1.03	----	Cold-drawn: Ult. tens. str. = 182,000 psi

Table II

DESCRIPTION OF REAGENTS

Name	Manufacturer	Remarks
	INHIBITORS	
Rodine 81	Am Chem. Paint Co.	Commercial inhibitor exemplary of those which are excellent for reducing metal attack, but aggravate embrittlement, particularly for stainless steel.
Rodine 250	" " " "	Special inhibitor developed in the course of this research, having excellent inhibition of metal attack and the only inhibiting influence on embrittlement of stainless steel so far found.
	SURFACE ACTIVE AGENTS	
Duponol ME	E. I. Du Pont Co.	Anionic: (fatty alcohol sulfate)
Igepon T	Gen'l. Dyestuffs Corp.	" (sulfonated amide)
Triton 770-Conc.	Rohm and Haas Co.	" (sodium alkyl aryl sulfate)
Ultrawet K	Atlantic Refining Co.	" (alkyl benzene sulfonate)
Armeen 12 (formerly AN 1120 A)	Armour and Co.	Cationic: (dodecylamine)
Catylon D	Hart Products Co.	" (amine salts of a fatty acid amide)
Triton K 60	Rohm and Haas Co.	" (alkyl dimethyl benzyl ammonium chloride)
Antarox A-200	General Aniline and Film Corp.	Nonionic: (alkyl aryl polyoxyethylene glycol)
Tween 81	Atlas Powder Company	" (polyoxyethylene sorbitan monooleate)
Polyethylene Glycol-200	Carbide and Carbon Chem. Div., Union Carbide and Carbon Corp.	" (condensation product of ethylene oxide)
-400	" " " "	" " " " "
-600	" " " "	" " " " "
Carbowax-1000	" " " "	" " " " "
-5000	" " " "	" " " " "
	FOAMING COMPOUND	
Foaming Compd. #9	Am. Chem. Paint Co.	Sulfite pulp waste liquor

Materials and Testing Method

In Table I the steels serving as specimens are described:

★ ★ ★

Details of the testing procedure must be sought in the other articles. Here it will suffice to summarize the present procedure as follows:

1. Duplicate specimens of 1/16-in. wire cut 4-in. long, cleaned with fine emery paper

2. Immersed in 10% (by vol.) H_2SO_4 at 77° C (170°F) for 15 mins.

3. Rinsed, dropped in ice water to arrest aging, tested within 30″ and 90″, respectively, of the conclusion of the test

★ ★ ★

This procedure provided a "blank" bend value referring to treatment in raw acid, and these values will appear at the left on the ordinate of all charts. Because of the possible importance of the aging phenomenon, the duplicate samples tested at 30″ and 90″ have been kept distinct in previous work, but they will not be distinguished here because no important difference is detectable.

★ ★ ★

Along the abacissa on each chart there is measured the quantity of reagent added to this standard sulfuric bath. The path of the bendability from left to right therefore discloses the general effect of the reagent over a concentration range extending well past the proprietary addition in every case. The reagents are listed in Table II.

★ ★ ★

Observations

In Table III the results for the surface-active reagents are briefly summarized. The two inhibitors are not included because their behavior is known from other work[4]. The foaming compound will be considered separately.

Anionic Reagents

All anionic reagents were without effect on embrittlement for either steel, over a range far exceeding the proprietary. They were added to the raw acid in the described test and over a concentration range from 0.0 to 0.6 per cent by weight of the total solution. The proprietary addition is customarily 0.05 per cent. The blank bend value of 60 ± 5 degrees for Type 440-C was never changed; the blank of 90 ± 5 degrees for SAE 1020 was not changed, with the possible exception of a very slight improvement reflected in two out of fourteen specimens tested with Triton 770-Conc.

★ ★ ★

Cationic Reagents

Of the three cationic reagents tested, two reacted so strongly with the sulfuric acid bath, forming a precipitate, that their detailed study was abandoned. Armeen 12 would not dissolve in either the acid solution or in pure water, hot or cold; nor did it dissolve when subjected to ultrasonic vibration of 450,000 cps. Nevertheless, proprietary additions were tested as a matter of course:

There is no important change indicated.

★ ★ ★

As for Catylon D, this reagent developed a milky solution, but one allowing more detailed study. The data, plotted in Figure 1, are expectedly erratic because of the reactivity with the solution; but they show a positive improvement of bendability for the carbon steel, a full bend of 180 degrees being attained, though at additions much greater than the proprietary. There is no effect on the stainless steel, embrittlement occurring throughout all tests to exactly the same extent as that caused by the raw acid.

★ ★ ★

With regard to this Figure and those to follow, the data for stainless steel are designated by white discs, those for carbon steel by black discs. The shaded areas depict the change in bendability caused by additions of the reagent. The dark narrow band usually appearing for the stainless steel merely measures the experimental error or assumed range of the blank bend value, against which the data can be compared.

★ ★ ★

In the first test in Figure 1—an addition of 0.006%—the bend values for SAE 1020 are 80 and 87 degrees compared to blanks of 90 and 95, which suggest a slight embrittling effect. The point would not deserve mention on the basis of these data alone, except that such "reversed curves" are common in these studies[1, 4].

★ ★ ★

Nonionic Reagents

Apparently it is the rule that nonionic reagents decrease embrittlement, though only for carbon steels. Figure 2 presents the data for Antarox A-200. Recovery is quick and decisive, a full bend being attained for duplicate specimens at the proprietary addition of 0.05%. If there is any effect, however, on the stainless steel, it is in the direction of slightly increased embrittlement in the very high concentration range. A slight reversal

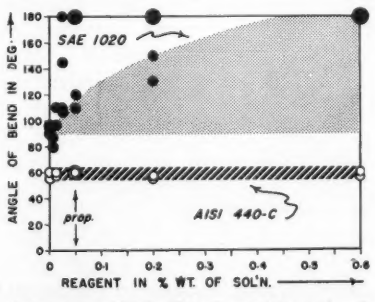

Figure 1 — Bend values for carbon steel and stainless steel pickled in a 10% H_2SO_4 solution containing the cationic surface active agent Catylon D. Pickling time 15 mins., temp. 77° C (170° F). The stippled area indicates the general improvement in bendability of the carbon steel caused by the reagent. The heavily shaded band represents the blank bend range for the stainless steel pickled in raw acid.

Table III

SUMMARY OF RESULTS FOR SURFACE ACTIVE AGENTS

Reagent	Reaction
	ANIONIC
Duponol ME Igepon T Triton 770-Conc. Ultrawet K	No effect on either steel
	CATIONIC
Armeen 12	*Precipitates heavily, no detected effect
Catylon D	Milky solution, improves SAE 1020 only
Triton K-60	*Precipitates heavily, no detected effect
	NONIONIC
Antarox A-200	Improves SAE 1020, no effect on AISI 440-C
Tween 81	Same, but difficult to keep in solution
Polyethylene Glycol-200	**Improves SAE 1020 only
-400	" " " "
-600	" " " "
Carbowax-1000	" " " "
-6000	" " " "

*Proprietary addition only tested; see text.
**Increasing improvement with increasing molecular weight.

Table IV

	Bend Value in Degrees			
	SAE 1020		AISI 440-C	
Reagent	Blank	Test	Blank	Test
Armeen 12	90 ± 5	85, 95	60 ± 5	65, 67
Triton K-60	90 ± 5	90, 90	60 ± 5	55, 52

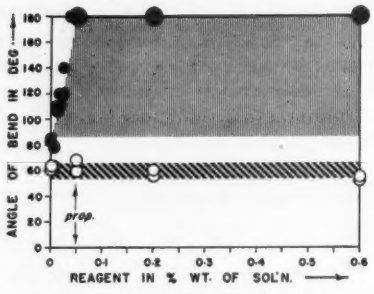

Figure 2 — Bend values for SAE 1020 steel (black discs) and AISI 440-C steel (white discs) pickled in 10% H_2SO_4 solution containing the nonionic surface active agent Antarox A-200. This reagent strongly inhibits embrittlement of the carbon steel, but has no significant effect on the stainless steel

Table V

Bend Values for Tween 81

Wt.%	SAE 1020	AISI 440-C
.00625	90,100	60, 60
.0125	87,100	60, 57
.025	110,180	—
.05	85,180	57, 60
.10	120,180	—
.20	180,180	60, 57
.65	180,180	60, 55

in the curve for carbon steel is again indicated by the bend values of 80 and 77 degrees at the first addition—0.006%.

★ ★ ★

Tween 81 similarly improves the bendability of the carbon steel, with no effect whatsoever in the stainless steel. The recovery is slower, however, and the data much more erratic, one of the duplicate specimens still failing at twice the proprietary 0.05% addition:

Particularly interesting is the behavior of the polyethylene oxides of increasing molecular weight. The data are listed in Table VI.

★ ★ ★

The first of the series, Polyethylene Glycol 200, causes little if any change to either steel over a wide concentration range. The next reagent, with a molecular weight designated "400", definitely improves the carbon steel, causing a few full bends at 0.05 wt.%. The next heavier in the series, Polyethylene Glycol 600 and Carbowax 1000, fully restore the full bend at .05 wt.%; and Carbowax 6000 even restores it with an addition of only .0125 wt.%. As for the stainless steel, no effect at all is noted, unless it is a tendency to **increase** embrittlement slightly with the reagents of very high molecular weight.

★ ★ ★

In Figure 3, the data are plotted for Polyethylene Glycol 600 and Carbowax 6000 to show the nature of the recovery curve for these two typical members of the series. Added to this plot is a third curve showing the amount of each reagent required to cause a full bend of 180 degrees. The points, shown as large white discs, are estimates derived from the data in Table VI. The stippled area bounded by these points then shows those combinations of concentration and molecular weight which inhibit embrittlement. The cooperation of these two factors is interesting, particularly in view of the fact that the **molecular percentages,** which are the proper thermodynamic measurements for the reagent, are much smaller in the range where the effect on embrittlement is greatest. It is also interesting that the curve suggests an asymptote near the molecular weight of Polyethylene Glycol 200, embrittlement remaining unaffected at this and lesser molecular weights regardless of concentration.

Table VI

Bend Values for Solutions of Polyethylene Oxides

Reagent	Wt.%	SAE 1020	AISI 440-C
Polyethylene Glycol-200	0.0125	77,77	60,65
	.05	80,77	67,67
	.20	90,82,95,97	65,62,62,62
" " -400	.0125	85,110	65,60
	.023	100,130	60,60
	.05	180,115,180,180, 100,130	60,60,60,60
	.20	180,180	60,60
" " -600	.0125	95,180	60,52
	.023	145,130	62,57
	.05	180,180	60,52
	.20	180,180	52,55
Carbowax -1000	.0016	80,100	65,60
	.0048	90,180	60,57
	.0125	120,125	60,60
	.05	180,180	60,57
	.20	180,180	57,52
" -6000	.0016	95,87	—
	.0048	100,120	—
	.0125	180,180	57,50
	.05	180,180	55,55
	.20	180,180	55,50

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Surface Active Agents in Combination with Inhibitors

With these individual effects of the surface active agents determined, it now becomes important to evaluate their behavior used in combination with a pickling inhibitor.

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For this part of the study, two inhibitors were selected representing two extremes of activity with regard to hydrogen embrittlement: (1) Rodine 81 and (2) Rodine 250. The latter was developed in the course of this research[4], particularly through the efforts of F. P. Spruance, A. Douty, and A. Saukaitis of the American Chemical Paint Company. It is the only commercial inhibitor so far known which reduces embrittlement for stainless steel. It is also one of the most powerful inhibitors of embrittlement for carbon steel. Rodine 81, on the other hand, markedly increases embrittlement of stainless steel and is one of the few inhibitors so far studied which also increases to some extent the embrittlement of carbon steel. Both inhibitors, incidentally, give excellent protection against metal loss. The bendability data for Rodine 250 have been published[4], but not for Rodine 81, and these are accordingly given in Table VII.

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In choosing surface active agents, one was selected from each of the anionic and cationic groups, and two from the nonionic group to represent the range of molecular weights:

Anionic—Triton 770-Conc.
Cationic—Catylon D
Nonionic—Antarox A-200
Nonionic—Carbowax 1000

Each of these four reagents was added over a range of concentration to a standard sulfuric acid solution containing a proprietary addition of each of the two inhibitors in turn —eight series of tests—and these were repeated for each of the two grades of steel—sixteen series in all. Selected concentrations of inhibitors and their respective "blank" bend values are as follows:

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From these sixteen series, four distinct groups of data evolve:

First, *carbon steel with Rodine 250* has a "blank" bend of a full 180 degrees, and this is not detectably interfered with by any of the additional reagents in any proportions. These results are probably to be expected, since none of the surface active agents has shown any important effect on carbon steel except to improve its bendability.

Second, *stainless steel with Rodine 81* shows no variation in its "blank"—the very low 25 ± 5 degress — regardless of type or proportion of surface active agent present.

Third, *carbon steel with Rodine 81* shows improvement for all additions of all reagent types, including the previously inert anionic group, but the progress and extent of the improvement is much altered by the presence of each reagent.

Fourth, *stainless steel with Rodine 250* shows in every case improvement which is appreciable but erratic.

★ ★ ★

Further consideration of the first two groups is unnecessary. The data for the third group are plotted in Figure 4. The "blank" for each of the four series of tests is shown as a heavily shaded base-line at 60 ± 5 degrees. Because of the irregularity of the data for the bath additions, the enclosed area is not shaded as usual, but the range of the points is shown by stippling. Thus, one finds the course of embrittlement following the low-lying stippled path above the base-line at **"a"** for Antarox A-200, in sharp contrast to the quick recovery that that reagent demonstrated in the previous Figure 2 when used in an uninhibited bath.

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At "b" in Figure 4 the data are coherent for Triton 770-Conc., showing an important recovery in embrittlement which stands in contrast to the ineffectiveness of this anionic reagent when used in the absence of the inhibitor.

At "c", Carbowax 1000 reaches 180 degrees with only one specimen and shows a large scatter, whereas it unanimously attained the full bend at 0.05% and all greater concentrations in the absence of the inhibitor.

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At "d", Catylon D begins a climb toward the full bend as in the previous Figure 1, but then reverses the trend as it passes up to and through an addition of 0.05%.

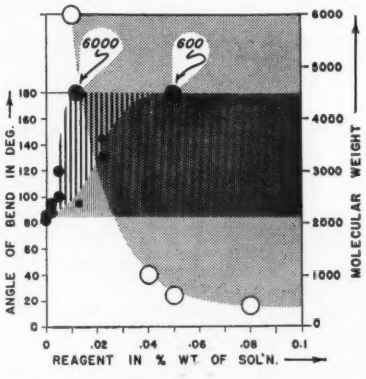

Figure 3 — Combined plot for effects of the polyethylene oxides of different molecular weight on the hydrogen embrittlement of carbon steel. (Left) Curves for Polyethylene Glycol 600 and Carbowax 6000 show inhibiting effect on embrittlement which is greater for the heavier molecule. (Right) Large white discs show for a series of these reagents the limiting concentrations causing recovery of a full bend. Concentration and molecular weight are cooperative factors, the stippled area depicting the full-bend range * * *

In brief, the inhibitor and the surface active agents in every case interact in some unknown way to affect the course of hydrogen em-

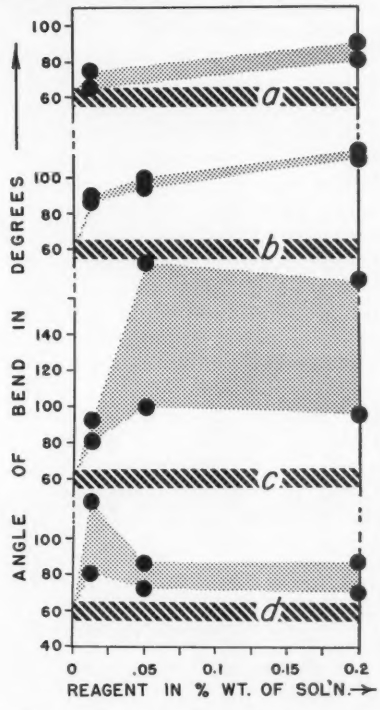

Figure 4 Data for surface active agents used in combination with Rodine 81 inhibitor for the pickling of carbon steel. Heavily shaded band is blank bend value for standard bath with proprietary addition of inhibitor. *a* = Antarox, A-200, *b* = Triton 770- Conc., *c* = Carbowax 1000, *d* = Catylon D * *

Table VII

Effect of Rodine 81 on Bendability

cc/200 cc. sol'n.	SAE 1020	AISI 440-C
.0000	90,95	65,60
.0125	80,75	45,42
.025	80,85	40,40
.05	50,65	30,25
.10	50,57	25,25
.20	60,65	27,25
.40	72,67	27,25
.80	70,80	30,27
* 1.6	97,100,107	30,30

* In excess of saturation.

Table VIII

Blank Values for the Inhibited Baths

Inhibitor	Concentration	SAE 1020	AISI 440-C
Rodine 81	0.125cc/200cc of sol'n.	60 ± 5	25 ± 5
Rodine 250	3.0 gms./"	180	100 ± 5

brittlement caused by either when used alone.

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As for the behavior of stainless steel in a Rodine 250 solution, the data are given in Table IX. The anionic reagent Triton 770-Conc. shows little if any improvement; but each of the others, particularly in the high range of concentration, boosts the bend value from its blank near 100 degrees up to an occasional full bend. The data are erratic, signifying an indeterminate interaction of the two chemicals, but one which predominantly results in an improved bendability. The low bend values in the Antarox A-200 group are the result of using two extreme inhibitor contents, one high and one low. The blank value for only 0.6 gms./200 cc of inhibitor is not far from the values in the Table for the first Antarox addition.

★ ★ ★

Foaming Compound

In Figure 5, data are plotted for a commercial foaming compound, often added to pickling baths to reduce spray. This particular compound is interesting because of the probability of its having an active sulfur component, for sulfur is an element of the "promoter" type which strongly aggravates hydrogen absorption.

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In accord with expectation, the bend values for both steels drop importantly when the foaming compound is added to an uninhibited solution. There seems to be an early slight decrease in bendability followed by a sharp fall at concentrations near 1cc/200cc sol'n. However, this concentration is so much greater than the customary addition in commercial pickling that it is important only from a theoretical standpoint. The compound was not tested in combination with an inhibitor.

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Conclusion

From these tests the following conclusions can be drawn regarding the effect upon bendability—as a measure of hydrogen embrittlement—of various surface active agents, used alone and in combination with inhibitors, and for both SAE 1020 carbon steel and AISI 440-C stainless steel:

★ ★ ★

1. Anionic reagents have no effect upon the bendability of either steel pickled in uninhibited 10% sulfuric acid;

2. Cationic reagents react with the pickling solution, but in some cases improve the bendability of carbon steel;

3. Nonionic reagents characteristically improve the bendability of carbon steel, although the contribution from Polyethylene Glycol 200 is insignificant;

4. The effect of the nonionic surface active agents in inhibiting embrittlement of carbon steel increases importantly with increasing molecular weight;

5. None of the surface active agents affects the stainless steel one way or another, embrittlement continuing in their presence exactly as in the raw acid;

6. Inert when used alone, a representative anionic reagent used in conjunction with two types of inhibitors exhibited an effect on embrittlement in each of the inhibited baths;

7. In combination with an inhibitor which has the special characteristic of aggravating hydrogen embrittlement, surface active agents of each of the three types uniformly show (a) no effect upon the stainless steel, and (b) an irregular improvement of carbon steel, which is considerably altered from that of the same reagent in an uninhibited bath;

8. In combination with an inhibitor especially designed for minimizing hydrogen embrittlement, the surface active agents uniformly show (a) no detectable effect upon the full-bend blank value for carbon steel, and (b) a slight additional improvement for the stainless steel. Although the improvement of the stainless steel is in most cases erratic or slight, the effect is an exceptional one and stands in contrast to the data (1) for the uninhibited solutions, (2) for the other inhibitor series, and (3) for most bath additions that have been studied in the entire course of the work to date. The behavior of stainless steel in regard to hydrogen embrittlement is anomalous and requires much further study;

9. Addition of a foaming compound to an uninhibited bath aggravates embrittlement, though only importantly at a concentration far exceeding the proprietary. The embrittling effect is probably due to an active sulfur component.

★ ★ ★

Acknowledgement

The authors wish to acknowledge the **Office of Naval Research** and the **American Chemical Paint Company**, co-sponsors of the research;

Table IX

Surface Active Agents in a Rodine 250 Inhibited Bath (Stainless Steel)
3.0 gms. Rodine/200 cc. sol'n.
Blank bend value = 100 ± 10 degrees

Reagent	% Wt. of Sol'n.	AISI 440-C
Triton 770-Conc.	0.0125	90,100
	.05	90,92
	.20	117,120
Catylor D	0.0125	107,95
	.05	95,180
	.20	180,120
Antarox A-200	*0.0125	50,55
	.40	90,70
	**0.0125	90,120
	.40	130,180
Carbowax 1000	0.0125	110,75
	.05	72,130
	.20	105,180

* 0.6 gms. Rodine 250/200 cc
** 4.2 " " " "

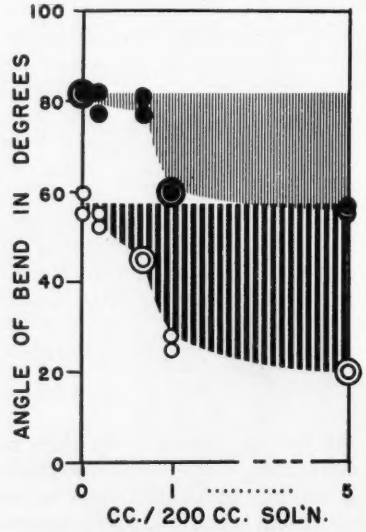

Figure 5 Effect of foaming compound added to uninhibited standard bath. Both carbon steel (black discs) and stainless steel (white discs) show a marked increase in embrittlement at high concentrations. * * * * *

and particularly **Messrs. F. P. Spruance, A. Douty, A. Saukaitis, and E. Stockbower** of that Company, who contributed much to the direction of the study and who were particularly responsible for the development of the special inhibitor Rodine 250, designed for minimizing the embrittlement of stainless steel.

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'WAY DOWN SOUTH IN DIXIE will be held the

SOUTHERN REGIONAL MEETING

of the

WIRE ASSOCIATION

May 17 and 18, 1951, at the Henry Grady Hotel, Atlanta, Georgia. In the afternoon, Thursday, there will be technical papers by John Middleton, Metallurgist, Republic Steel, and K. P. Campbell, Metallurgist, Sheffield Steel. W. L. Dull, Supt., Wire Mills, Sheffield Steel, will serve as chairman. The spring meeting of the Board of Directors will preceed the technical session in the A. M. Cocktails will be served before the banquet in the evening through the courtesy of Standard Industrial Compounds Company and R. H. Miller Company. R. S. Lynch, President of Atlantic Steel will address the group following dinner.

On Friday, with C. J. Beneke, manager, Reynolds Metals, as Chairman, J. H. Girdler, Vice Pres., Charge Operations, Atlantic Steel Co., will deliver a paper on mill safety. In the afternoon there will be a plant inspection trip to the Atlantic Steel plant, followed by a barbacue as guests of the Atlantic Steel Company.

A fee of $6.00 will be charged to cover the banquet and busses.

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Special Nail Is Formed and Upset Rapidly

By E. A. Eliason
Superintendent of Tool Department,
Tinnerman Products, Inc.
Cleveland, O.

The author here describes the operations in forming special nails. Eight operations performed in rapid sequence include notching the wire and the formation of a half head on each end. We are glad to present this article for the ingenious methods that produce a complicated item at a low cost.

Although most Tinnerman fastenings are produced from flat ribbon stock, purchased in coils, the "Speed Clinch Nailing Fastener" shown in Fig. 1 is an exception. This product, employed in large quantities to fasten synthetic clapboards to soft insulation sheathing is manufactured by Tinnerman Products, Inc., Cleveland, at a high rate, using circular section soft steel wire of 0.058-in. dia.

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The whole job is done in an S-1 Nilson wire forming machine which has been rebuilt in part, especially to provide larger bearings to accommodate the heavy loading and to withstand the high speed necessary for high output. Of the eight operations required, that producing the two heads necessitates the heaviest blow. Each head is offset and has a shape slightly greater than a semicircle, the straight edge of each head being flush with one side of the wire. Heads measure approximately 3/16 in. at the long diameter and, because of the offset, constitute an unusual upsetting job.

★ ★ ★

As shown in Fig. 1, the nail is formed back on itself, having a U-bend in place of the point on an ordinary nail. There are also two round notches, one at each leg of the shank. These are so placed that, when the heads of the nail bend bottom on a hard surface, the U-bend opens out and a right angle bend occurs at the notch in the longer shank. There is also a longer bend at the second notch. The result, when the two heads are driven flush, is that a flat ended loop is formed (more or less like that in a cotter-pin) and the nail anchors itself in the soft sheathing, thereby holding the clapboard in place.

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Tools that do the notching, forming and heading are shown, as well as they can be in a photograph, in Fig. 2, which illustrates the setup in the Nilson machine. The sequence of operations in this machine are as follows: First, the wire is fed in, in the usual way, to a stop. Second, before being cut off, a die in the press head attachment which is a part of the machine, produces the two notches. Cut off then takes place and leaves the piece in position for bending around the thin center form, which has a rounded edge and is supported from above. The fourth motion advances the front slide which bends the two legs around the form, the tool being grooved so that, at the end of its stroke, the workpiece rests in these slots except for two overhanging ends, one longer than the other but each having the same unsupported length.

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At the end of the forming stroke, the front tool comes to rest and remains so while the tools in the rear

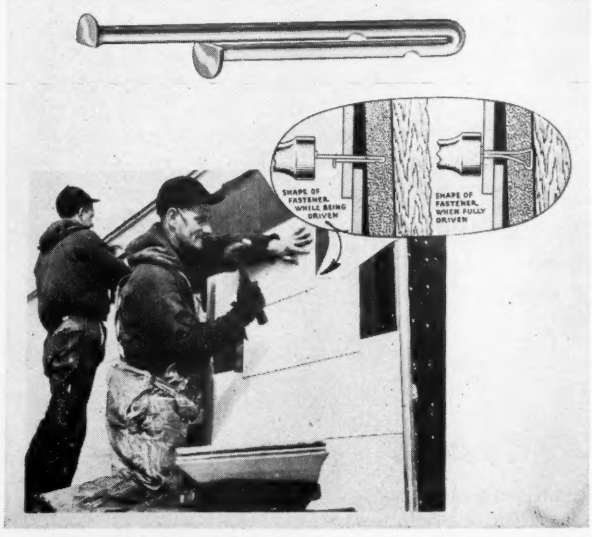

Fig. 1—Special "Speed Clinch Nail" for fastening synthetic clapboards to soft insulation sheathing in the manner shown by insert sketches. When fully driven, the two heads are driven flush, a loop is expanded to effect a lock.

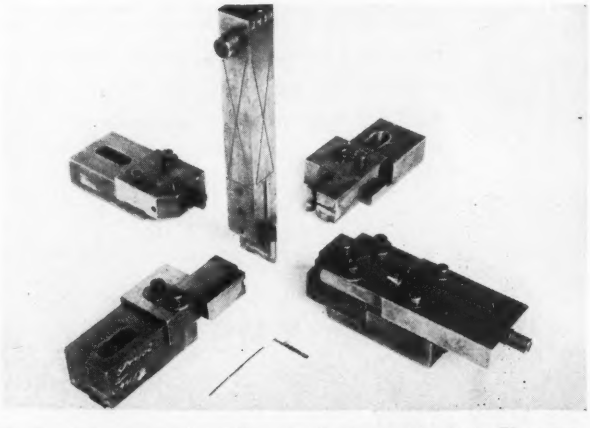

Fig. 2—Tools as set up in a Nilson wire forming machine in the Tinnerman plant to produce the clinch nail fastener shown in Fig. 1, at the rate of 10,000 an hour, by the sequence of operations described in the text.

slide, which straddle the form, are advanced. This fifth motion forms the two heads from the protruding ends, of the wire. As the wire is held tightly against the center form, the metal cannot flow toward the form but moves outward as the heads are upset. The result is that the heads are offset, the flat edges being against the center form and tangent to the shank wire.

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When the heading is complete, both front and rear tools remain fixed while (in the sixth motion) the center form is moved upward stripping it off the workpiece as the latter remains held by the slots in the front tools. Front tools are then further advanced and rear tools are partly withdrawn. This seventh motion advances the piece. Then the rear tools are again advanced, driving the workpiece deeper into the front tool slots and thereby closing the loop so that the two shanks (up to this point separated by the thickness of the form) are brought together.

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On this same eighth motion, which completes the workpiece, a slide, forming a portion of the front tool, is forced back against a coil spring, and, when the rear tool retracts, the spring forces the slide forward and, in combination with fixed side kickers, strips the work out of the front tool so that the nail falls into a tote pan. Completion of this eighth operation also completes the cycle and leaves the machine ready for the next cycle and production of the next piece, as the center form is again lowered and the other tools are retracted.

★ ★ ★

By equipping the machine with larger bearings and providing positive motions by precision ground cams and cam followers, it is possible to operate the machine at the rate of 10,000 pieces per hour or almost three a second, which is a rather high rate for a machine that performs so many operations, including the formation of two heads on a single piece in a single cycle.

★ ★ ★

An Interesting and Varied Program is now Being Arranged for YOU at the CANADIAN REGIONAL MEETING *in Hamilton, Can.,*

THURSDAY and FRIDAY, APRIL 19 and 20, 1951, ROYAL CONNAUGHT HOTEL

The Program: April 19th—Morning: Registration.

Afternoon: Plant visit to mills of The B. Greening Wire Co., Ltd., in Hamilton, manufacturers of Wire Rope, Screen Cloth, etc.

Evening: Banquet—to which the ladies are cordially invited.

April 20th—A.M. and P.M.: Technical Sessions, with papers on the following subjects: a) History of Insulated Wire and Cable in Canada; b) Nylon Field Wire; c) Fasteners—Bolts, Screws, etc.; d) Electric Drives for Wire Mill Equipment.

This is going to be a fine and worth-while meeting and you are urged to set these dates down now and plan to attend. Members will receive a hotel reservation card for themselves and guests. All wire men are welcome. If you need further information, please write, wire or 'phone the WIRE ASSOCIATION or the CANADIAN REGIONAL MEETING COMMITTEE: Chairman — James W. Galloway, The B. Greening Wire Co., Ltd., Hamilton, Ont., Can., or Secretary — E. V. Larson, The Larson Co., 98 Wellington St., W, Toronto, Ont., Canada.

We hope to see you in April in Hamilton.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET **STAMFORD, CONN.**

Knitted Coverings for Wire and Cable

Part 1—The Mechanics of Knitting

by H. I. Greene, Vice President
Fidelity Machinery Company, Inc.
Philadelphia, Pa.

1. Introduction

This treatise is concerned with the technical aspects of knitting including a description of the Knit Cover, its acceptability, the methods for determining yarn consumption, the different knitter models available and their operational principles.

★ ★ ★

2. Description of Knit Cover

This cover consists of two intertwined single knitted coverings. The stitches of the first covering cover the connecting yarn of the second covering, and the stitches of the second covering cover the connecting yarn of the first covering.

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Imagine one of the three knit covers slit lengthwise with the wire and flattened out. The pattern resulting is shown in Plate #1. The loops are on the diagonal, which means that the pattern is knitted in a spiral around the wire. In the picture there are eight ends of yarn represented by the horizontal lines. The vertical distance represents the circumference of the wire, so the wire can be imagined as extending indefinitely in a horizontal direction. The angle at the left, called the angle of mesh, represents the angle the spiral pattern makes with a cross section of the wire.

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Each individual covering is built up by four yarns equally spread over its circumference. Symmetrically arranged between the four yarns of the first covering are the four yarns of the second covering, thereby effecting a symmetrical layout of the eight yarns of the cable cover. In place of each yarn, there may be also used a yarn group.

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The illustration shows graphically the symmetry of a cable cover in one revolution of the needle-cylinder and with an assumed distance of travel of the conductor. The two covers "A" and "B" in the figures are differently marked. The number of needles (12), in the needle-cylinder are arranged in two groups. Needles 1, 3, 5, 7, 9, 11 will produce cover "A", needles 2, 4, 6, 8, 10, 12 will produce cover "B". By means of symmetrical angular changes of the cam rings, the needles move consecutively only the four yarns or yarn-groups (1A, 2A, 3A, 4A) for cover "A" and the four yarns or yarn-groups (1B, 2B, 3B, 4B) of cover "B" which lies between the four strands of cover "A". The intertwining of the coverings is plain-

Editor's Note

Refinements in knitting machinery manufacture in recent years have broadened its scope of use and added to efficiency of operation. In this presentation on the subject, the author has divided his article into two parts. The first is concerned with the mechanics of the knitting process; the second, with the economics of the method. In discussing the subject the author refers to the performance characteristics of the equipment manufactured by his company. Part II will appear in the March, 1951 issue of WIRE AND WIRE PRODUCTS.

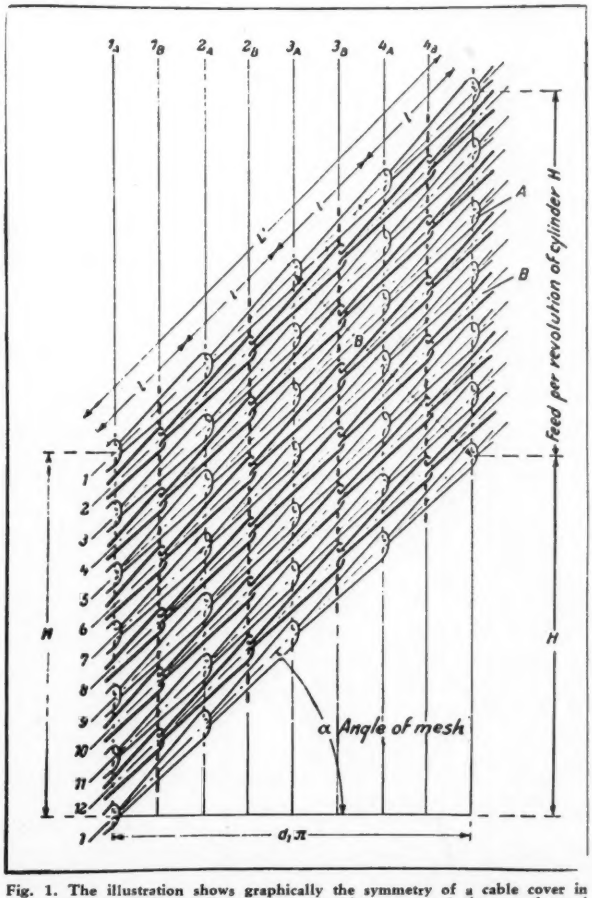


Fig. 1. The illustration shows graphically the symmetry of a cable cover in one revolution of the needle-cylinder and with an assumed distance of travel of the conductor. The wire extends indefinitely in the horizontal position.

ly seen in this figure.

★ ★ ★

The weight of the cover may be increased or decreased by changing the number of loops per lineal inch along the wire. Since the ends of the yarn connect alternate loops, there are really two layers of fabric on this cover held together and in place by the connecting yarns with little or no internal stress.

★ ★ ★

3. Acceptability of Knit Coverings

Over a period of years the advantages of covering weatherproof wire and cable by the knitting process has been demonstrated in conjunction with several of the most important manufacturers of weatherproof wire, and today many organizations use this type of covering.

★ ★ ★

The coverings produced on the knitter for Weather-Resistant (Weatherproof) Wire and Cable of the URC type, Rubber Covered Wires and Cables and Non-Metallic Sheathed Cable having a Cotton Knit Outer Covering have been approved as follows: American Standards Association, January 1948; Association of American Railroads, April 1949; Underwriter's Laboratories, Inc., January 1938 and April, 1950; Canadian Standards Association, August 1950.

★ ★ ★

A sample of the specifications which were approved by the American Standards Association, January 1948, follows:

Braid Construction

The conductor is to be covered by three (or two if the purchaser so specifies) closely woven or knitted braids of cotton except that the inner braid or braids for conductors No. 1/0 Awg or larger may contain jute yarn. In the manufacturing process, in any one braid, each carrier, bobbin, or needle shall carry the same number of ends* of yarn of the same size and ply** or of different ply but equivalent size, except that a maximum of four threads used for identification of the manufacturer or the year of manufacture may be of glass, cotton, jute, rayon, or other fibrous material and of a yarn size differing not more than four cotton-yarn numbers from the balance of the yarns in the same braid. The outer braid of woven-braid construction shall in all cases be made with not less than two ends of yarn. With the consent of the purchaser, other fibrous materials or an equivalent filling may be used in place of the inner braid or braids.

★ ★ ★

Requirements of Outer Braid Based On Inner Braid Construction

In all cases the outer braid shall be made of yarns equaling or exceeding the size and weight of the yarns used in the inner braids and shall be made with the same or a greater number of carriers or needles. If other fibrous material is substituted for the inner braids, the outer braids shall be made with the same or a greater number of ends of yarn per inch measured parallel to the axis of the conductor, and of yarns equaling or exceeding the size and weight of the yarns as furnished by the manufacturer in the outer braid of the same conductor size of triple braid covered wire and cable.

★ ★ ★

A sample of the tests undergone by the knit covering approved by the Underwriter's Laboratories, Inc., January 1938, follows:

Moisture Absorption Test
Flame Test
Flexibility Test
Abrasion Test
Installation Test
Construction Test

★ ★ ★

The knitted covering passed every one of the above tests and was equal or superior to braid in both these tests and the quality of the finished Knit Weatherproof Cable.

★ ★ ★

Underwriter's Laboratories, Inc., in April 1950, revised the Standard for Weatherproof Slow burning, and Slow burning Weatherproof Wires to include knitting as follows:

★ ★ ★

"The covering on a Type WP weatherproof wire shall consist of three or more closely woven cotton braids or the equivalent. The outer layer shall consist of a cotton braid or knit covering. The inner layer shall consist of cotton or of equivalent fibrous material. All layers of the covering shall be saturated with a moisture-retardant, insulating compound; and the completed product shall be finished to show a dark color. The saturation shall be such that diagonal cuts through the covering of the conductor will expose no unsaturated fibrous material."

★ ★ ★

A sample of the specifications which were in the process of approval by the Canadian Standards Association, August 1950, follows:

★ ★ ★

Clause 36 of the 1938 edition of CSA Specification C22.2 No. 48—Non-metallic Sheathed Cable — requires that "The conductors of a cable, with their protective sheaths and the fillers, shall be completely enclosed . . ."

★ ★ ★

There has recently been submitted to the Laboratory a construction of non-metallic sheathed cable which is approved except for the outer covering which consists of a saturated cotton knit. This product when investigated was found to comply with all the applicable requirements of the above specification. In addition, consideration was given to the knitted covering which was found to be substantially equivalent to a standard cotton braid with respect to resistance to abrasion.

★ ★ ★

This bulletin, therefore, is notice that non-metallic sheathed cable employing a cotton knit covering complying with the following requirements will be eligible for labelling.

Material

The cotton knit employed as an outer covering on non-metallic sheathed cable shall be closely knit in a spiral, and shall employ not less than 8 ends of a good grade of cotton yarn not less than No. 6 single ply in size, or the equivalent in plied yarn.

★ ★ ★

Construction

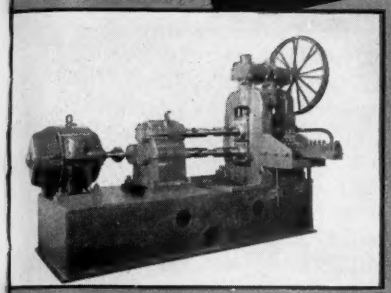
The knitted covering shall consist of two intertwined single knitted coverings. The stitches of the first covering shall cover the connecting yarn of the second covering, and the stitches of the second covering shall cover the connecting

*Ends—The number of threads (laid parallel) woven from one bobbin or tube.

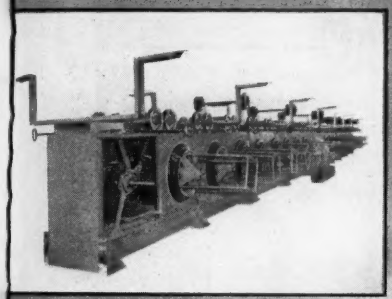
**Ply—The number of component parts twisted together to form a thread, each part consisting of fibre twisted together.

LOOK TO Wean FOR WIRE MACHINERY

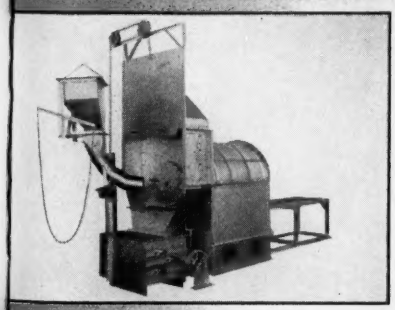
Process OR Product



2—Hi Wire Flattening Mill



Wire Galvanizing Take-Up Frame

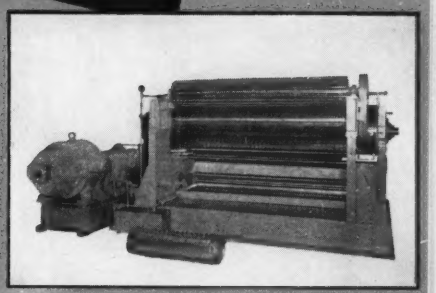


Nail Galvanizing Unit

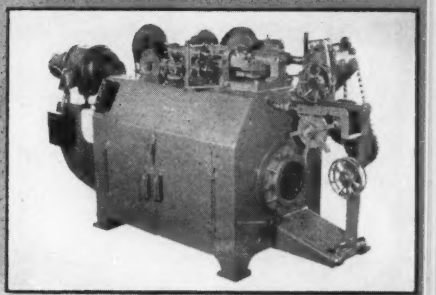
In the past few years tremendous progress has been experienced in the field of wire machinery. Production speeds have been tripled and quadrupled. Product quality has been greatly improved. Machines have been made easier to operate and maintain.

The Wean Equipment Corporation has been a large contributor to this advancement. Wean wire mill specialists have designed, built, and installed wire mill equipment for the leading wire producers the world over. If you make wire you should look to Wean for the best in machinery, service, and facilities.

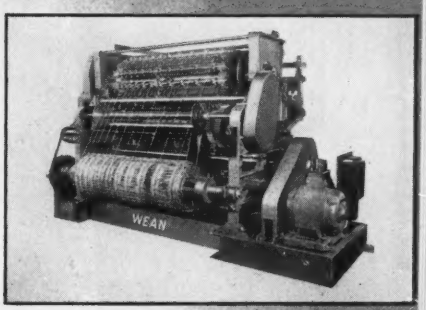
STRIP MACHINERY



Hexagon Netting Machine

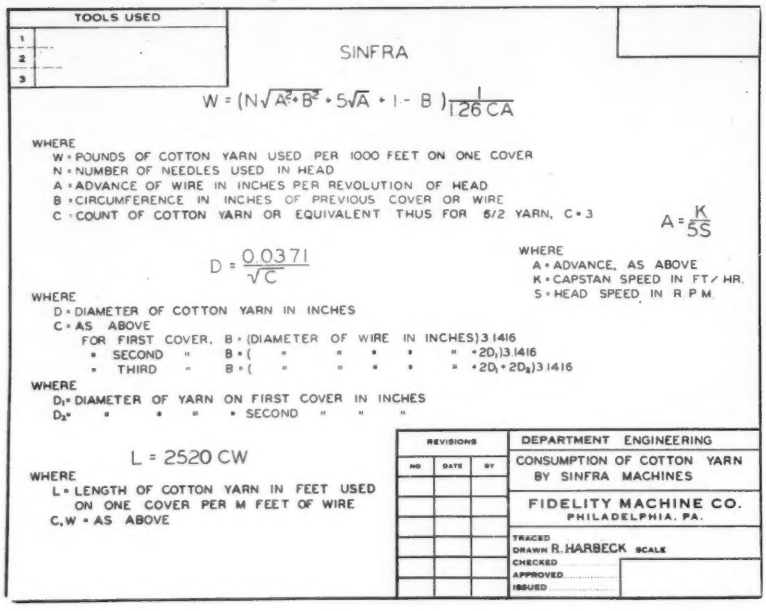


2 or 4—Point Barbed Wire Machine



Hinge — Joint Fence Machine

Wean Equipment Corporation
CLEVELAND, OHIO



TOOLS USED

1
2
3

SINFRA

$$W = \left(N\sqrt{A^2+B^2} + 5\sqrt{A} + 1 - B\right)\frac{1}{126\,CA}$$

WHERE
W = POUNDS OF COTTON YARN USED PER 1000 FEET ON ONE COVER
N = NUMBER OF NEEDLES USED IN HEAD
A = ADVANCE OF WIRE IN INCHES PER REVOLUTION OF HEAD
B = CIRCUMFERENCE IN INCHES OF PREVIOUS COVER OR WIRE
C = COUNT OF COTTON YARN OR EQUIVALENT THUS FOR 6/2 YARN, C = 3

$$A = \frac{K}{5S}$$

WHERE
A = ADVANCE, AS ABOVE
K = CAPSTAN SPEED IN FT./HR.
S = HEAD SPEED IN R.P.M.

$$D = \frac{0.0371}{\sqrt{C}}$$

WHERE
D = DIAMETER OF COTTON YARN IN INCHES
C = AS ABOVE
FOR FIRST COVER, B = (DIAMETER OF WIRE IN INCHES) 3.1416
" SECOND " B = (" " " " " " +2D1) 3.1416
" THIRD " B = (" " " " " " +2D1+2D2) 3.1416

WHERE
D_1 = DIAMETER OF YARN ON FIRST COVER IN INCHES
D_2 = " " " " SECOND " " "

$$L = 2520\,CW$$

WHERE
L = LENGTH OF COTTON YARN IN FEET USED ON ONE COVER PER M FEET OF WIRE
C,W = AS ABOVE

REVISIONS		
NO	DATE	BY

DEPARTMENT ENGINEERING
CONSUMPTION OF COTTON YARN BY SINFRA MACHINES
FIDELITY MACHINE CO.
PHILADELPHIA, PA.
TRACED
DRAWN R. HARBECK SCALE
CHECKED
APPROVED
ISSUED

Figure 2.

yarn of the first covering. Each individual covering shall be built up by 4 ends of yarn equally spread over its circumference. The 4 yarns of the first covering shall be symmetrically arranged between the 4 yarns of the second covering, thereby effecting a symmetrical layout of the 8 yarns of the cable cover.

★ ★ ★

4. Methods For Determining Yarn Consumption and General Discussion of the Wire Cover

In applying a cover to weatherproof wire, it is necessary to know the exact weight of cotton yarn applied per thousand feet. To understand the formula developed to predict this weight, it is necessary to explain some of the features of the knitter and how it works.

★ ★ ★

In Plate #1 showing the pattern of the textile covering, the total length of yarn is computed for one revolution of the knitting head. Disregarding curves for the present, it can be seen that the diagonal length L′ times twice the number of needles gives the total amount of yarn in the diagonal direction. To this must be added the yarn going in a horizontal direction which would

Figure 3.

TOOLS USED

1
2
3

CAPSTAN SPEED 1840 FT./HOUR
HEAD SPEED 480 R.P.M.
ADVANCE OF WIRE 767"/ REV. of HD.
NO. OF NEEDLES 12, 12, 14.

FIDELITY MACHINE COMPANY
PHILADELPHIA, 24, Pa.

CONSUMPTION OF YARN BY FIDELITY SINFRA KNITTERS ON WEATHERPROOF WIRE

WIRE SIZE	30% OF INSUL	FIRST COVER		SECOND COVER		THIRD COVER		YARN WEIGHT (LBS.)	YARN 30% TO 40% OF INSULATION	TWO LBS. OF YARN* CONSUMED EVERY:
#14	3.78	1.26	(12)	1.10	(14)	1.44	(12)	3.80	30.2%	17.2 minutes
#12	4.56	1.53	(10)	1.30	(12)	1.76	(10)	4.59	30.2%	14.2 minutes
#10	6.48	1 95	(8)	1.98	(8)	2.61	(7)	6.54	30.3%	10.0 minutes
# 9	6.72	2 25	(7)	2 01	(8)	2.64	(7)	6.90	30.8%	9.5 minutes
# 8	7 50	2 65	(6)	2.05	(8)	3.15	(6)	7.85	31.4%	8.3 minutes
# 6	9.75	2 75	(6)	3 41	(5)	3.99	(5)	10.15	31.2%	6.4 minutes
# 5	10 44	2 82	(6)	3 51	(5)	4.11	(5)	10.44	30.0%	6.2 minutes
# 4	11 28	3 46	(5)	3.61	(5)	4.25	(5)	11.32	30.1%	5.8 minutes

NOTE: The first figures in columns 3-5 show the weight of cotton in lbs of yarn per 1000 feet of wire. The figures following in parentheses show the equivalent count of the yarn on that cover. Thus (5) is the same as 10/2 or 5/1.

The time varies with the size of cone. A five pound cone will last 2-1/2 times as long as the figures shown.

REVISIONS			
NO	DATE	BY	REMARKS

DEPARTMENT ENGINEERING
YARN COMSUMPTION BY SINFRA KNITTERS FOR WEATHERPROOF WIRE
FIDELITY MACHINE CO., INC.
PHILADELPHIA, PA
TRACED DATE SCALE
DRAWN
CHECKED
APPROVED

be eight times the advance of the wire of one revolution of the knitting head. The multiplier 8 is used because there are eight ends of yarn. To these two quantities must be added a theoretical quantity for the yarn at the corners of the loops, which is best determined by tests under different conditions. The sum of these three quantities must be multiplied by factors to change the quantity per revolution to one thousand foot units of the covered wire. After simplification the formula obtained gives results within two or three percent of weighed samples.

★ ★ ★

The advance of the wire is the distance the wire travels in inches for one revolution of the head. This distance varies between ½″ and 1″, and depends on the speed of the capstan as well as the speed of the head. The distance L′ can be computed as the hypotenuse of a triangle, one side of which is the circumference in inches of the previous cover or wire. The other side of the triangle is the advance of the wire.

★ ★ ★

The result is shown in Plate #2 which gives reasonably accurate results of the weight of cotton yarn in pounds per thousand feet on one cover. Symbols are used for the different variables and are explained below the formula.

★ ★ ★

The relation between the advance, capstan speed, and the head speed is shown in another formula at the right of the diagram, where the advance equals capstan speed divided by five times the head speed.

★ ★ ★

For the second and third covers it is necessary to know the diameter of the cotton yarn in inches and the count of yarn. If it is desired to know the length of yarn in feet used on any one cover the formula at the bottom can be used.

★ ★ ★

The ideal weight of the cotton yarn varies from 3.78 lbs. per thousand feet for #14 wire to 11.28 lbs. per thousand feet on #4 wire.

★ ★ ★

Thus the weight of the cotton yarn for each cover is controlled by the specifications and economics. The specifications do not determine the individual weight of each cover, so some flexibility is allowed.

★ ★ ★

For instance, if the total weight of all covers is 7.5 lbs. per thousand feet, the weight of the first cover can be two or three pounds per thousand feet, the second cover can be two or three pounds, but the outer cover must not be more or less than the balance required to make up 7.5 pounds per thousand feet. However, the weight of the outer cover must be equal to or greater than the weight of either of the inner covers.

★ ★ ★

A table showing the consumption of yarn under different known conditions is shown in Plate #3.

★ ★ ★

Wire sizes are in the column on the left. The following data is for number 14 wire and the conditions shown. The ideal weight is 3.78 pounds per thousand feet. Number 12 or 14 equivalent count yarn is required for the first two covers and number 12 on the outer one. The computed weights for each cover are shown as 1.26, 1.10 and 1.44 pounds per M respectively with a total computed weight of 3.80 pounds. This computed weight would be 30.2% of the insulation. On the average two pounds of yarn will be consumed every 17.2 minutes. The operating conditions are shown in the lower right hand corner.

★ ★ ★

Tests are applied to the saturant to determine softening points, penetration, pliability, loss by heating, rise in softening point and change in penetration after heating. The finished wire or cable is also submitted to tests which include conductor tests, mineral filler content, thickness of covering and weights of the component parts of the finished wire. The finished wire is also required to pass a bending test whereby the wire is wrapped around its own diameter at a temperature of 32 degrees fahrenheit. This is a severe test of the textile covering but the knit product well meets the requirements of this and all other A.S.A. physical tests.

★ ★ ★

5. The Different Types of Knitter Models

The three most popular are described in the following paragraphs.

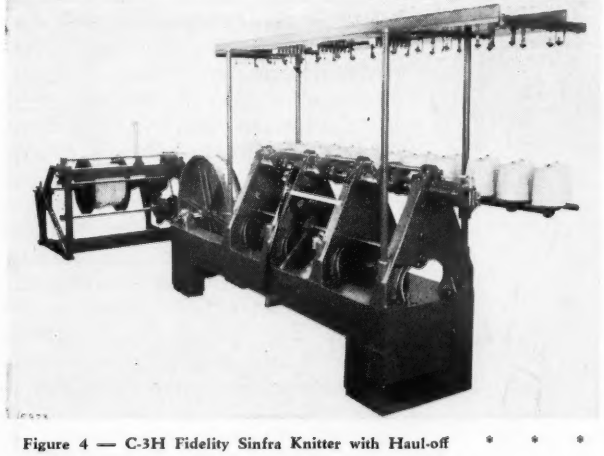


Figure 4 — C-3H Fidelity Sinfra Knitter with Haul-off * * *

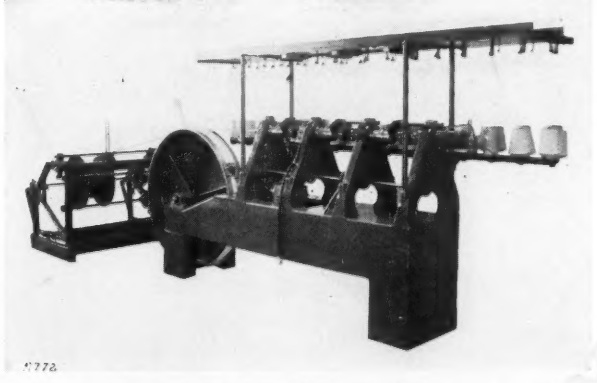


Figure 4A — C-3HL Fidelity Sinfra Knitter with Haul-off * * *

Although these machines utilize different sizes of bases, knitting heads, hauloff reels and capstans, they all bear a basic resemblance to the knitter illustrated in Plate #4.

★ ★ ★

One type, with a 29/64″ head opening, can apply up to three simultaneous knitted coverings on solid wire from A.W.G. #14 (.064″ dia.) to #4 (.204″ dia.) It is complete with motor drive, two 12 needle heads, one 14 needle head, a 36″ draw off capstan and a hauloff mechanism for a reel 40″ diameter by 30″ wide.

★ ★ ★

Another, with a 15/16″ head opening, can apply up to three simultaneous knitted coverings on solid wire from A.W.G. #3 (.229″ dia.) to #000 (.410″ dia.) and on stranded cable from #4 (.232″ dia.) to #00 (.419″ dia.) It is complete with motor drive, one 14 needle head, one 16 needle head, one 18 needle head, a 48″ draw off capstan and a hauloff mechanism for a reel 50″ diameter by 30″ wide.

★ ★ ★

A third type, with a 1⅝″ head opening, can apply up to four simultaneous knitted coverings on solid wire from A.W.G. #00 (.365″ dia.) to #0000 (.460″ dia.) and on stranded cable from #0 (.373″ dia.) to 450,000 circular mils (.772″ dia.) The 1⅝″ head opening with an 1¼″ end guide opening allows the covering of cables larger than 450,000 circular mils where critical weight ratios need not be maintained. It is complete with electronic motor and control, two 20 needle heads, one 22 needle head, one 24 needle head, a 48″ draw off capstan but without hauloff mechanism.

★ ★ ★

Special knitters also have been developed for unique jobs such as the covering of a flat steel strip where the principal requirement is for a double cover construction as used in the building construction industry.

★ ★ ★

Where only a single cover is required, a single head horizontal type knitter has been developed to replace the obsolete, clumsy and inefficient vertical type single head machines which were previously the only kind of knitters available.

6. Operation of Knitters

Plate #4 shows a knitter. The bare wire on the right enters the wire straightener, goes through the three knitting heads, each of which applies a knitted covering to the wire, is wrapped around the capstan a half dozen turns, and goes to the hauloff stand on the left. The capstan is geared to the motor and travels at a constant speed. Different diameter wires require different speeds, so a number of change gears are provided and can easily be installed to change the speed of wire travel.

★ ★ ★

The three knitting heads are geared to a common countershaft which in turn is geared directly to the motor, so that the heads revolve at a constant speed. These knitting heads revolve around the wire and contain 12 or 14 needles which do the knitting in a spiral. The center head rotates in a direction opposite to the other two so the spirals cross each other and cover all the interstices of the preceding covers. The cotton yarn, in 2 to 5 lb. cones, is placed on the spindles of the supply stand in the rear of the machine. The upper deck provides a convenient storage shelf for replacement cones. The yarn is guided through individual electric stop motions under the top deck to the knitting heads. The lever near the center of the countershaft enables the attendant to operate the machine by hand at a very slow speed when required.

★ ★ ★

The curved bar above the wire straightening device ending in a cylindrical roller on the right rides on the wire as it enters the machine, and drops down at the end of the reel or a break in the wire automatically stopping the machine. A series of grooved rollers revolving at a speed of approximately 480 rpm, stabilize the wire as it passes through and take out the kinks or sharp bends.

★ ★ ★

Plate #5 shows a view of a knitting head with the cap removed, so that a better view of the needles can be obtained. This cap is removed when it is desirable or necessary to change the needles. The covered wire is leaving the head on the right and entering the head on the left. The yarn is seen passing through pigtail guides to the needles which do the knitting. The three heads are designed to hold 12 needles in the first two and 14 in the last one.

★ ★ ★

It is possible to change the weight of the cover by changing the number of loops per line inch. Each needle forms one loop in the pattern of the cover shown previously. As the heads rotate at a fixed speed of 480 rpm, this change in weight can be accomplished by changing the gears varying the speed of the capstan in relation to the knitting heads which varies the take-up speed, or by adjusting the individual knitting heads to increase or decrease the length of the stitch. These 2 adjustments are commonly made when minor variations in the weight of the cover are required. When major changes are

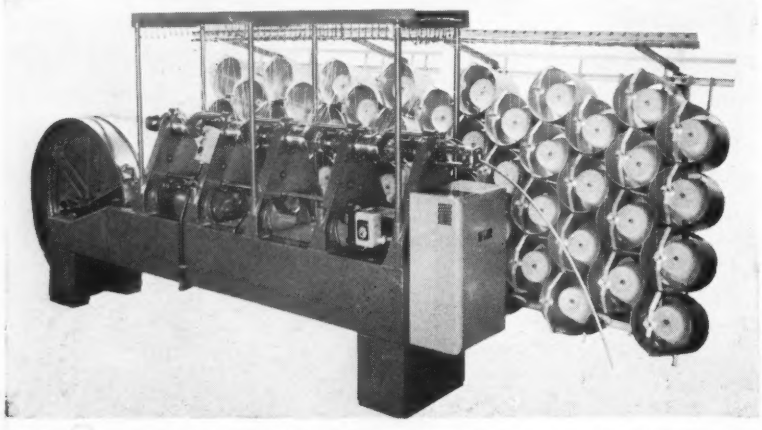


Figure 4B — C4 HJ Fidelity Sinfra Knitter * * * * * * * * *

made necessary, different counts of yarn are used on one or more of the covers.

★ ★ ★

Plate #6 shows a magnification of the needle end of a knitting head. The yarn is seen guided through loops on the right and diagonally leftward. The ends of the needles are provided with a hook at the very end to catch the yarn, and a latch which is free-moving and will open or close as forced by the yarn.

★ ★ ★

The second needle from the top in front is shown ready to move leftward and catch the yarn. The second needle below that one has already grabbed the same strand and is at the lowest point of its cycle. The needles alternate in employing each strand. The first needle on the top front is still moving rightward and will pass in front of the first diagonal strand of yarn.

★ ★ ★

While the left half of this assembly is rotating downward, the right part containing the yarn guides is fixed so that when the first needle is on its leftward path it will be in a position to catch the second diagonal yarn from the top. As the needles enter the head, the loop of yarn previously engaged is forced rightward against the latch, closing that and forcing that loop off the right end of the needle. In this way the cycle is completed. The left half of this assembly is rotating at a speed of 480 rpm and each needle makes four complete cycles per revolution of the head. Thus the needles travel at a speed of nearly 2000 cycles per minute, with a distance of travel of roughly an inch. In starting, a new thread it is necessary only to lead the yarn through the proper guides, hold it diagonally in front of the needles, operate the machine for a few turns by hand and the needles will pick up the yarn at the proper place. Broken yarn can be repaired by knotting the two ends. The machine will carry the knot through the needles satisfactorily.

★ ★ ★

A chain at the lower right of the hauloff stand is driven by the capstan shaft at a constant speed. Directly to the left of the chain sprocket is a clutch which permits the hauloff to move at a slower speed as the reel is filled up. A driven chain causes the hauloff reel to rotate and the traverse guide to move back and forth and permit a proper lay on the reel.

★ ★ ★

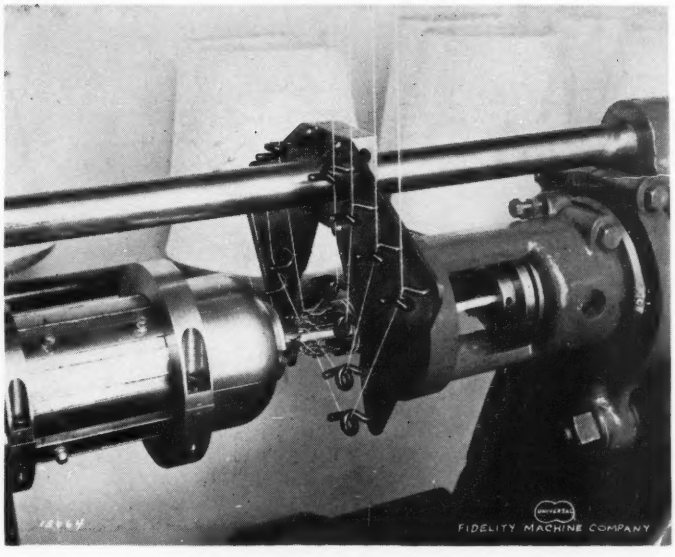


Figure 5 — Close up of the Knitting Head with Cap Removed * * *

PART II of this article will be published in the MARCH, 1951 issue of WIRE & WIRE PRODUCTS.

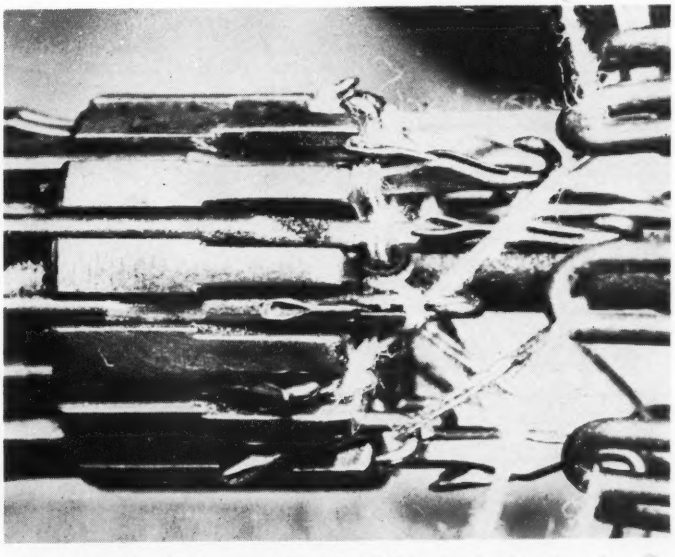


Figure 6 — Magnification of needle end of Knitting Head * * * *

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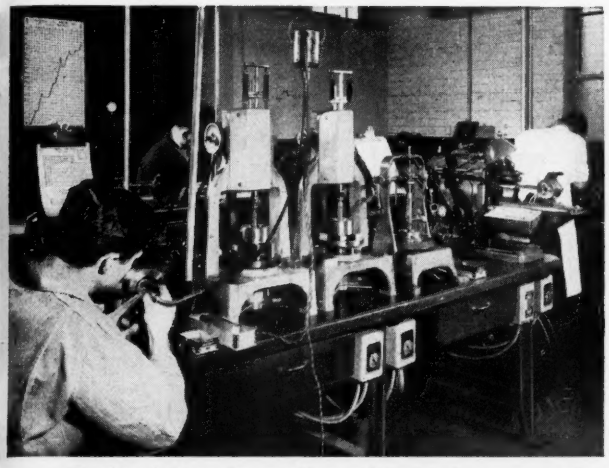
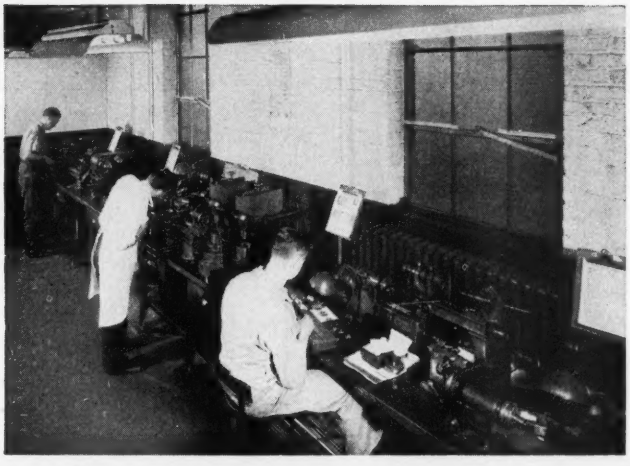
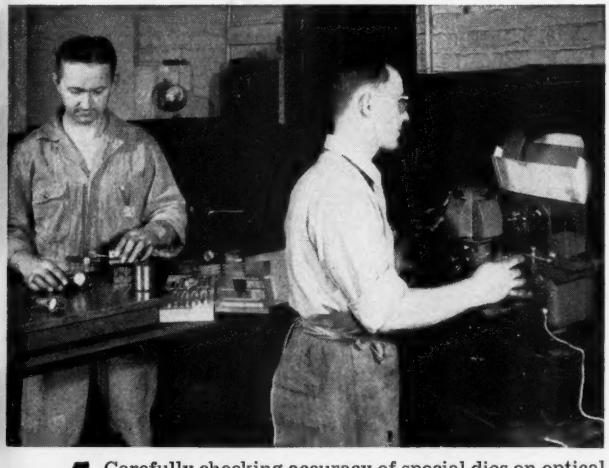


2 Servicing shape dies with modern precision equipment . . .



3 Servicing all die sizes R1 through R19 . . .



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Butt Welding Wire and Rod Economically

by H. J. Chamberlain, Res. Engr.
The DoAll Company
Des Plaines, Ill.

Job simplification, particularly in the manufacture of wire products, is always a matter of great importance especially in these days of sky-rocketing costs. The author here tells how wire, rod, band and tape stock can be quickly and economically butt-welded in a wide variety of shapes and forms.

Simplifying the small shop problems indicates sound management and welding in all its forms plays no minor part in this connection. The butt welding of small parts has of late been approached from a new scientific angle with the introduction of a versatile unit, one so foolproof in design that an inexperienced operator can execute a precision weld with a few hours of practice.

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With the modern device of this type, shown in Figure 2, it is now possible to butt weld hundreds of diversified items previously requiring far more expensive and less efficient equipment. Automatically controlled and eliminating set-ups and change-overs, the new unit is economical whether a single weld or hundreds are involved. This piece of equipment has a wide field of applications such as joining the ends of wire, rod, band and tape stock; it is available in portable and pedestal types.

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This electrical tool is not altogether an innovation, as a matter of fact it was developed several years ago to be used as a built-in unit for the well known contour sawing machines now covering every industrial field. It was therefore a simple task for engineers in this particular line of work to adapt this device to the butt welding of parts previously mentioned. The standard jaws or electrodes originally designed to weld the sawbands serve equally as well for any kind of steel flat stock up to ½″ wide and 1/16″ thick. Only minor changes were made to the conventional jaws so that permanent auxiliary jaws could be fitted thereto for butt welding rods to a maximum diameter of ⅜″ and particularly as extensions to drills, taps, bits, rotary files, screwdrivers, etc. When the ends of wire forms can be aligned, the welding should of course be done in these latter jaws; otherwise, the weld can be executed in the standard jaws or some shop means devised to speed quantity production.

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The welding cycle is most simple and dependable. The first step is to have both ends to be welded as square as possible and free from any foreign matter. A grinding wheel is incorporated in the unit to square the ends of wire, rod or band. The ends of rod or wire should be clamped in the respective electrodes with a gap of 1/32″ to 1/16″, depending on diameter. The amount of current to use per a given diameter is indicated on a dial, the dial is set accordingly and the operator is ready to press the welding switch button. This automatically advances the movable electrode to make the electrical contact and with the amount of advance predetermined, the current is automatically shut off on time at the split second. The weld likewise cools off in a few seconds and the operator then presses the annealing switch button and jogs it until the joint becomes a dull red.

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Improper annealing is one of the chief causes of weld failure, if the wire, rod or band is subject to flexing or bending in any way the following suggestions will help materially. Experience has shown that an annealing temperature of 950 to

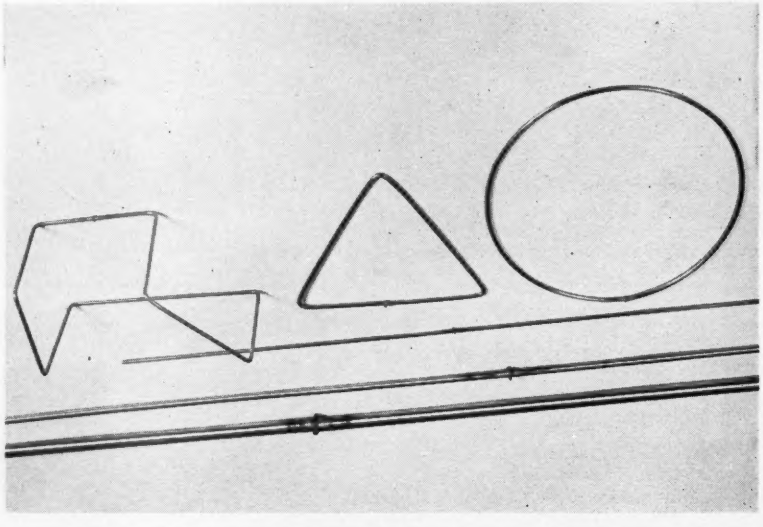

Figure 1—Typical wire and rod applications for butt welder shown in Figure 2.

1100 degrees F. will reduce the hardness sufficiently, it will also prevent any tendency toward re-hardening or embrittlement of the weld caused by a too rapid cooling rate.

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As previously mentioned, proper annealing temperature can better be obtained by joggling the annealing switch, thus giving the weld short surges of heat of 10 to 20 seconds duration or until the joint just begins to glow a very faint blood red. The glow should not be allowed to become brighter and is not visible in a lighted room until the temperature reaches 1200 degrees, this heat is definitely too high for safe annealing and consequently some means of shading the weld should be used so the glow will become apparent at 950 degrees.

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Butt welding should not be confused with flash welding, the former means a fused joint whereas the latter refers to an arc welded joint. The butt welding unit herein described has a transformer capacity of 6 KVA, a welding voltage of 6½ volts and annealing voltage of 1½ volts. Very little experience is required on the part of the operator to reach a production of 300 completed welds per 8-hour day, including removing the flash. Listed below are the current applications for the device:

★ ★ ★

Wire and rod, whether the stock is round, square or hexagon, providing it is within the ⅜" limitation recommended.

★ ★ ★

Coping saws, jig saws and band saws.

Extensions to drills, taps, reamers, bits, ball gages, screwdrivers and grinding wheel points and hundreds of other light welding jobs around the plant.

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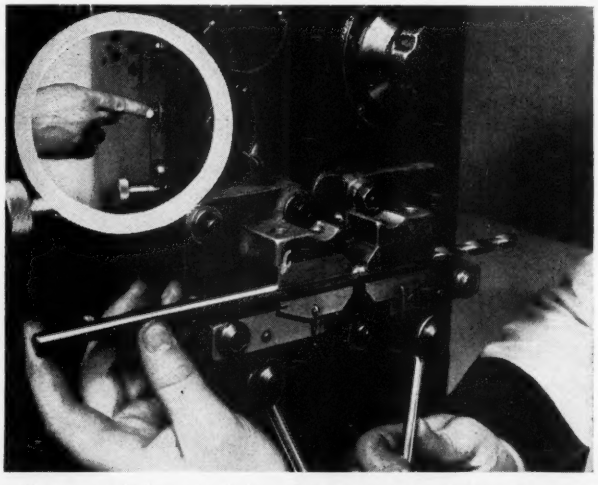

Figure 2 — Fully automatic butt welder as set up for fusing rod extension to drill. Insert: Timed welding switch

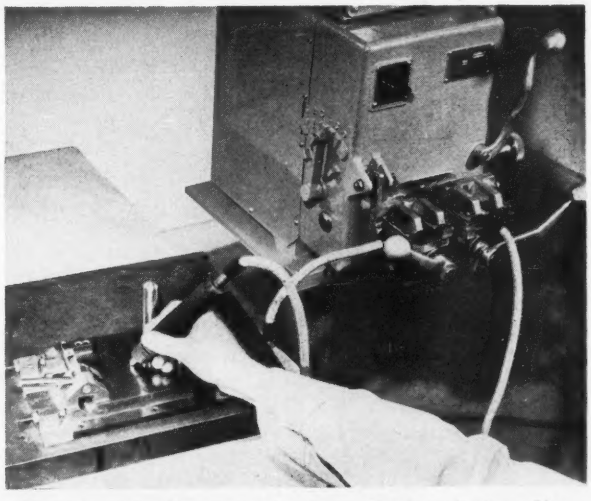

Figure 3 — Attachment to convert butt welder into electric marking device for shop tools

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THE WIRE ASSOCIATION
RICHARD E. BROWN, Executive Secretary

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Material Handling in Wire Rope Plant

"Experience is the best teacher", it is said. Observing the experience of others is one short-cut to getting our knowledge the hard way. Hence, this treatise on how one plant is making effective use of material handling equipment to cut handling costs, should prove of value to others.

A constantly recurring operation —that of unloading and warehousing shipments of wire in coils—at one time, for a single shipment of 24,000-lb. required the services of six men for a full two-and-a-half hours to handle at the St. Louis, Mo., plant of A. Leschen & Sons Rope Company, manufacturers of wire rope. All of the work, including the transfer of the coils from highway trailers into the warehouse by means of 4-wheeled buggies, was performed manually. Each coil in the shipment was handled at least twice in the unloading-transfer-warehousing operation.

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Under practices now prevailing, a shipment is handled by four men in an hour—a reduction of some 73% in the man-hours expended on the operation, or from 15 to 4 man-hours, as opposed to the old, entirely manual, methods. Utilized in the work is a 3,000-lb. capacity, battery-electric industrial truck. This is fitted with a ram on which the coils of wire are carried in loads of as much as 2,000-lb. at a single time.

★ ★ ★

Due to the faster handling of incoming raw material, and that destined for processing, production machines had at all times ample supplies of material, and production expanded. The labor relieved from tasks involving heavy lifting and strain was transferred from material handling operations and assigned to other work.

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Because there would be no lack of material in the production area and because certain of the workers would be transferred from manual labor to more profitable occupation, the installation of the battery-electric ram truck was welcomed, not only by management but by the workers as well.

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The savings in man-hours in the receiving and warehousing operations are only a part of the benefits that have been realized by the Company since it placed the ram-truck in operation during mid-1947, according to George Pine, Plant Superintendent.

★ ★ ★

"There has been the faster movement of material, both on receipt and into process, thus assuring an ample supply for production machines," he said, "while greater use is made of previously unutilized warehouse space because the ram-truck can pile, or remove, loads at a height of as much as 86 inches from the floor. This means that

Fig. 1 — Coils of galvanized wire used in the manufacture of wire rope are being unloaded from a highway trailer truck in the receiving yard at the plant of A. Leschen & Sons Rope Company, St. Louis, Mo., by means of a 3,000-lb. capacity, storage battery-powered industrial truck equipped with a ram. The average load handled by the ram-truck is 2,000-lb., and the work of unloading and warehousing a 12-ton load of wire coils takes four men—(three on the trailer and the ram-truck's operator)—approximately one hour. Prior to installation of the ram-truck, the work was performed in entirety by purely manual means, and took six men some 2½ hours to do the same job * * * * *

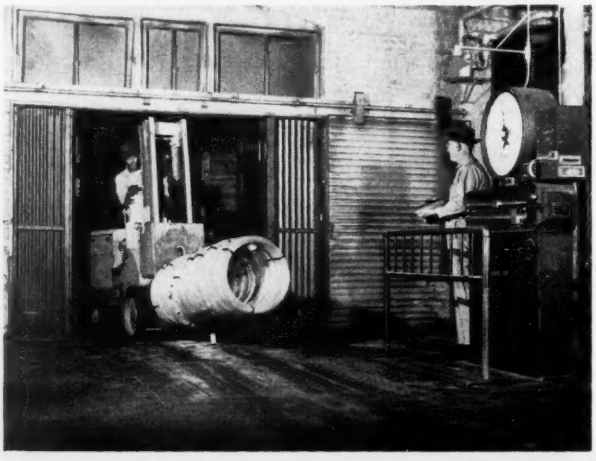

Fig. 2 —Coils of wire—(approximate weight of the load shown in above picture being 2,200-lb.)—are picked up and moved from the box car, interior of which can be seen through the doorway, to scales for weighing by a storage battery-powered ram-truck at the plant of A. Leschen & Sons Rope Company, St. Louis, Mo. Since truck was installed in mid-1947, work of handling incoming material into storage has been speeded, warehouse capacity has been approximately doubled, and floor area assigned to plant's test department has been cut by one-third, although a greater volume of material is handled * * *

ANOTHER IMPORTANT MEMBER OF WATERBURY-FARREL'S LINE OF WIRE-WORKING MACHINERY

HOW THIS WATERBURY-FARREL WINDER puts trolley wire in its place

This new Waterbury-Farrel Trolley Wire Winder has an automatic, hydraulic, spool-traversing feature that assures a very accurate lay of wire.

The wire moves straight ahead while the spool itself traverses. It moves across the path of the wire at exactly the right pace to put the wire precisely where it belongs on the spool. A special slip friction device compensates for the build-up of the spool.

This machine can be furnished to take spools up to 56" O.D., 31" barrel with a 26" traverse. It has a maximum capacity of 7,500 lbs. of wire plus approximately 1,800 lbs. for the spool . . . a total load of 9,300 lbs.

Further information on this machine or on any of the equipment indicated below is available on request.

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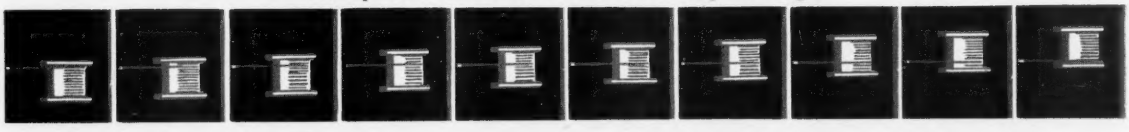

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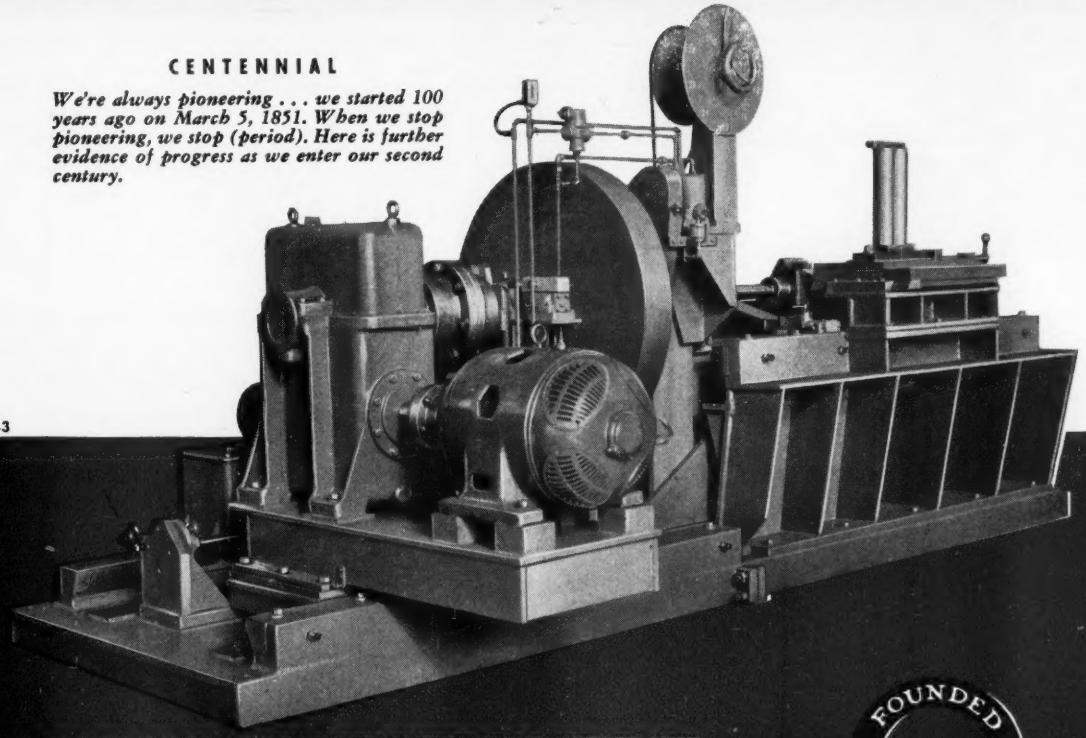
We're always pioneering . . . we started 100 years ago on March 5, 1851. When we stop pioneering, we stop (period). Here is further evidence of progress as we enter our second century.



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In Equipment, Experience Counts . . . We're 100 in '51!

much more material can be stored on the same floor area as formerly. It was not economically feasible, with purely manual means, to build, or tear down, high stacks of coiled wire."

★ ★ ★

Space, too, is saved in the testing operations, because the use of the ram-truck enables quicker movement of the wire—consequently less storage time in this department. The space saving here is about 33-1/3 per cent.

★ ★ ★

The battery-electric ram-truck is not the only such powered piece of industrial truck equipment utilized by the Company. Reliance for movement of coils of wire from the testing floor into production, and then through some of the processing operations, is placed on two battery-powered trucks, each of the fixed platform type, and each capable of carrying a load of 6,000-lb. A third platform truck, purchased back in 1920, after 30 years service, is still used daily for supplementary work.

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Some galvanized wire is shipped in coils to the Leschen plant aboard highway trailer trucks in lots of some 12 tons at a time. Three men work in the body of the trailer, moving the coils up to the tail-gate and placing them on the ram-truck's tongue, ten coils at a time, or an approximate 2,000-lb. Movement then is from the receiving yard to scales in the warehousing department where each load is weighed and checked; then to the testing floor and finally into a storage room awaiting requisition by production.

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Shipments of galvanized wire are also received in box cars, in amounts of from 50,000 to 60,000-lb. at a time. Again four men, three in the car and the ram truck's operator, unload and storage the shipment—the ram-truck working directly into and out of the box car. This operation is another that formerly was performed entirely by purely manual means with the aid of hand trucks. The man-hours consumed in the operation were in proportion to the total weight of the shipment received. A car now is unloaded, and its contents weighed and warehoused, in approximately two hours.

★ ★ ★

Incoming shipments of black wire are in box cars, in loads totaling up to 80,000-lb. Contents of these cars are unloaded on to driver-led, bat-

Fig. 3—Coils of wi're are stacked in "laced" position in storehouse of A. Leschen & Sons Rope Company's plant, St. Louis, Mo., by operator of a battery-electric ram-truck and a helper. As shown in picture, these stacks of coils are built to a height higher than a man's head, a practice which permits greater storage of material on a given floor area, but one that was not economically feasible under manual methods of warehousing that prevailed before ram-truck was installed * *

tery-powered, low platform trucks by two men. These trucks—after weighing—are unloaded on the testing floor. After the testing operations are completed, the coils are transported by the ram-truck to the warehouse, where they are piled and "laced" by the truck operator and a helper.

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In discussing the performance of the trucks, Superintendent Pine said that the warehouse crews utilized them for a full single shift, while some use was made of the platform trucks at intervals during other shifts to keep production lines maintained. Trucks are inspected each day before being placed on duty, with a more comprehensive check being made weekly. Batteries are subjected to a daily examination and test. Maintenance charges, for both trucks and batteries, have been "negligible", according to Mr. Pine.

★ ★ ★

Not only does work and material move faster through use of the ram and fixed platform battery-electric trucks, in both warehouse and production areas, Mr. Pine said, but the workers have welcomed their installation since they have been relieved, to a great degree, from many tasks involving heavy lifting and strain while, as was said, labor removed from handling operations has been assigned to other duty in the Leschen plant.

★ ★ ★

Keep in Mind the Meetings in 1951 of THE WIRE ASSOCIATION

HAMILTON, ONTARIO — Regional Meeting, Thursday and Friday, April 19 and 20 at Royal Connaugh Hotel. James W. Galloway, B. Greening Wire Company Chairman.

ATLANTA, GEORGIA — Regional Meeting, Thursday and Friday, May 17 and 18, Henry Grady Hotel. Barbecue and plant inspection will be feature. C. L. McGowan, Atlantic Steel Company, Chairman. Spring Meeting of Board of Directors will be held here at same time.

SAN FRANCISCO, CAL.—Regional Meeting to be held Sir Francis Drake Hotel Friday, June 15. Karl H. Baessler, California Wire Cloth Corp., Chairman. Dates and details of program to be announced later.

CHICAGO, Ill. — Annual Convention, Oct. 22-25 at LaSalle Hotel. Ralph B. Roth, Ludlow-Saylor Wire Co., Chairman of Program Committee.

These coming meetings are given now to enable you to make plans to attend them. Members and guests of members are invited to attend any or all of the meetings.

GOSSIP from BRITAIN

By a majority of only six votes the British Parliament recently brought into operation the take-over of the iron and steel industry by the nationalized body—The Iron and Steel Corporation. The industries so far far taken over—coal, railways, transport, gas and electricity —large profit makers under private enterprise, have run at losses since they became government owned. The whole country is uneasy in regard to steel, which has been Britain's biggest dollar-earner for Britain and has an unexampled history of trouble-free production.

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The take-over raises some most interesting problems for the wire producing industry. Some plants will be "nationalized', whilst others remain under private enterprise. For example, The United Steel Companies of Sheffield are to be nationalized; within the orbit of this merger functions Samuel Fox Co. Ltd., wire manufacturers and makers of umbrella frames. Fox's will become government owned with many similar firms. On the other hand, a concern whose principal business is making wire remains under private enterprise, despite the fact that its satellite concerns are engaged in the production of billets or rods. These subsidiaries will mainly be nationalized and taken from the parent.

★ ★ ★

The recent announcement by the Societe Metallurgique de Gorcy of Paris regarding the machines they have had under test for an associated firm for the mechanical scaling of low carbon steel rods, (see wire and wire products, August, 1950) has caused the greatest interest throughout Europe and it is known that the largest wiredrawers have hastened to place orders. Many British concerns sent representatives specially to view the plant in operation and the general reaction was enthusiastic. Should this de-scaling plant prove effective under prolonged test, it is going to revolutionize the process of rod de-scaling and make great savings in cost on the initial chemical pickling and cleaning of steel rods; in effect, cutting out this process altogether. Intermediate pickling after heat treatment is not affected.

★ ★ ★

A link with America was broken by the recent death of Mr. Nolan, chairman of Vi-Spring Products Ltd., one of the leading firms of mattress manufacturers in this country. Mr. Nolan was instrumental in introducing to this country in 1924 the mattress spring interior patents of the Marshall Mattress Co., Leaside, Canada, at that time owned in the U.S.A. by Ginsburgh of Chicago.

★ ★ ★

MICROMETER PRECISION — MICRO-WELD TRADE MARK REGISTERED

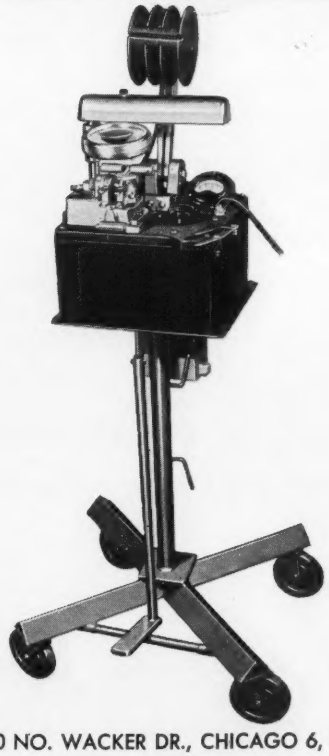
MODEL S.E.M.T. MICRO-WELD BUTT WELDER

This welder was designed and developed expressly for welding all types of fine wire: Aluminum, Copper, Brass, Bronze, Steel and Steel Alloys, ranging in size from .005" to .020" diameter.

Unit design of frame, transformer and power sub-assemblies permit other range of sizes to suit requirements.

Equipped with a temperature indicating annealing and tempering device, voltage regulator and meter to compensate for voltage fluctuation, wire cutters, extra large 5" diameter magnifying glass, fluorescent light and extension cord. Welder can be supplied for bench mounting, or mounted on 4-wheel truck.

The adaptability of this unit for welding all types of wire, either ferrous or non-ferrous, in sizes from .005" to .020" diameter, makes it ideal for the fine wire manufacturer.



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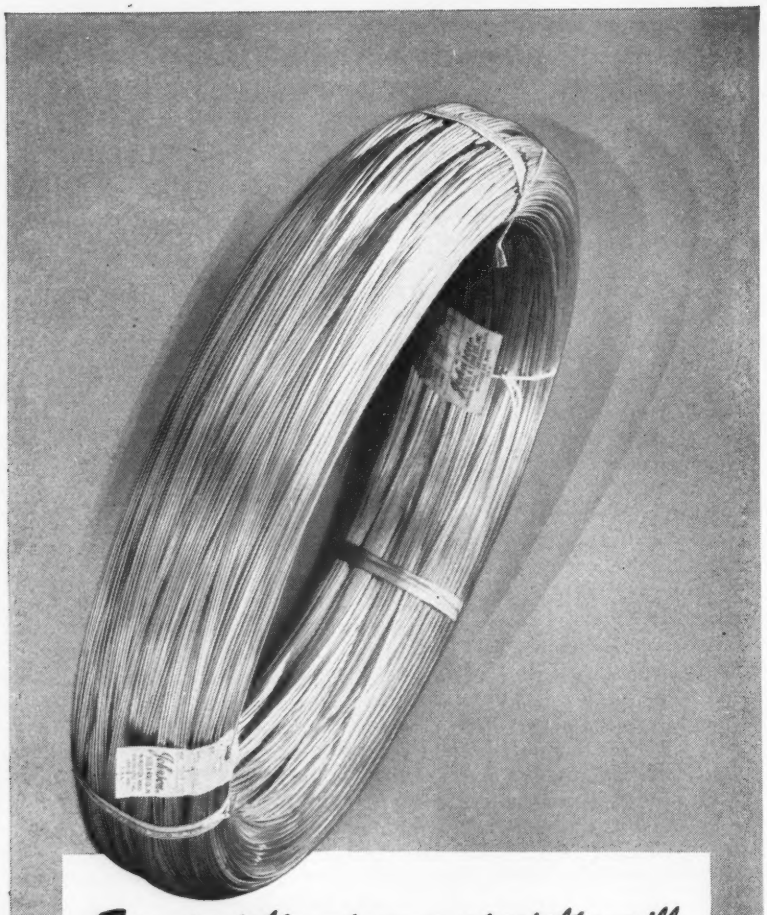

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German manufacturers of wire fabricating machinery are rapidly returning to the world markets. Advertising is being placed by the leading firms in the principal European Continental technical papers, and they are receiving a steady flow of enquiries and orders. Those firms who operate on the western side of the iron-curtain were left remarkably free from war damage and have been able quickly to recover production output. They are now forming a solid obstacle to British manufacturers of competing machinery, although, except in a few cases such as formers, and the simpler range of plant, British houses have never presented any really serious competitive front; it seems that it must be accepted that German machinery makers will again resume their role of principal suppliers, particularly of the more intricate types of machines.

★ ★ ★

Reports have also been current in this country that Japan is offering wire working machines in Australia and New Zealand at about half of current European prices. They also have a firm grip on the Indian market, although here it is practicable to assume that with government aid the Indians will soon be producing much of their own capital equipment.

★ ★ ★

More Aluminum to Come from Alcoa

Two major ALCOA programs that together will boost America's production of defense aluminum by more than 25 per cent annually were announced in Washington by I. W. Wilson, senior vice president of Aluminum Company of America.

★ ★ ★

The first, a "quick action" plan will be started immediately, and shortly will be producing added supplies of the vital light metal for the national defense stockpile at the rate of approximately 158,000,000 pounds a year, using stand-by facilities owned by the company which require the use of higher-cost electric power than is economical for peacetime smelting of aluminum.

★ ★ ★

The second phase is an expansion plan that involves the erection of

permanent new capacity by ALCOA, capable of producing approximately 240,000,000 pounds of aluminum a year. This new capacity will be achieved by enlarging the smelting facilities at ALCOA's Point Comfort, Texas, plant, plus the construction of a new plant utilizing electric power generated from gas or coal fuels.

★ ★ ★

Reynolds Stepping Up Production

Two hundred million pounds of increased aluminum capacity will be brought into production by **Reynolds Metals Company by** 1952, it was announced recently by Vice President **David P. Reynolds.** This increased quantity of aluminum represents Reynolds' contribution toward meeting the increased military needs for the metal.

★ ★ ★

Atlantic Steel to Expand

The Atlantic Steel Company, Atlanta, Ga., is launching a three-year expansion program that will increase its steel-making capacity fifty per cent and double its output of rolled products, **Robert S. Lynch,** president of the company has announced.

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The new program follows on the heels of a two-million dollar four-year post-war modernization and improvement program that has greatly widened the scope of products, facilities and services offered by the Atlantic Steel Company.

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The Atlantic Steel Company now operates three open hearth furnaces, a blooming mill, rod mill, wire mill, two narrow strip mills, various wire products departments, as well as heat-treating, galvanizing, forging and stamping facilities and supplementary operations. Many of its products are marketed throughout the South under the trade-name of "DIXISTEEL".

★ ★ ★

Continuous Ingot Casting Machine

Belgameric, Inc., 350 Fifth Avenue, New York 1, N. Y., has described a revolutionary new process for the continuous casting of steel ingots in their publication, Belgameric Digest, Vol. IV, No. 2. Copies of this issue will be sent to those interested in the subject.

★ ★ ★

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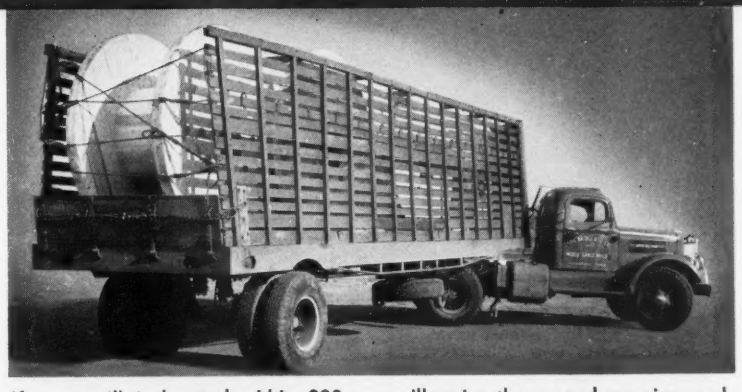
FOR
CABLE, ROPE
AND WIRE

PLUS A SPEEDY SHIPPING SERVICE



If your mill is located within 200 miles of Hazardville, BRIDGE trucks will deliver reels to your door — overnight, if necessary.

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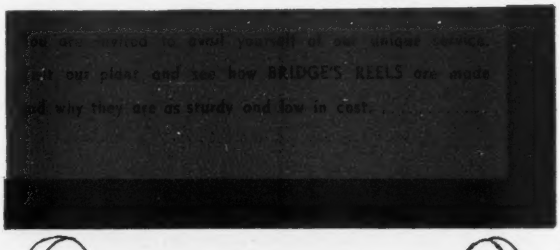

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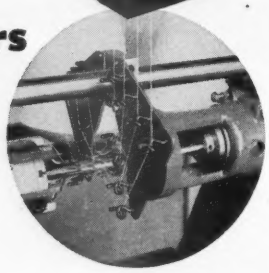

Enlarged view of Knitting Head

The production of *one* FIDELITY SINFRA wire covering machine is equivalent to the capacity of 15 triple deck braiders! This impressive production achievement is made possible by the reliable and extremely high speed Fidelity Knitting Head, using stationary, large yarn cones.

The SINFRA Knitter is built to the precision standards long associated with Fidelity and is equipped with automatic electric stop motions, controlling both the wire and yarn supply. As the wire enters the SINFRA Knitter it is straightened by a unique straightening device before being passed through a series of 3 knitting heads.

SINFRA Knit is widely acclaimed as the most modern method of covering wire. Wire covered by SINFRA Knit is accepted by the American Standards Association, Association of American Railroads, Underwriters' Laboratories, Inc. and the Canadian Standards Association.

SINFRA Knitter is designed to permit horizontal operation at normal working level. No longer need your operators crawl or stretch to service wire covering equipment and noise level is reduced to a pleasing hum. Top companies have found their answer to production in SINFRA Knitters. Why not write for complete information on this development to lower your production costs and increase your productive capacity.

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Manufacturers of intricate precision machinery since 1911.

FIDELITY MACHINE COMPANY INC.

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Government Wire Production Information

New Copper & Copper Alloy Rod Standards

Printed copies of Simplified Practice Recommendation R241-50, Copper and Copper-Alloy Rod, (Round, Hexagonal, and Octagonal), are now available, the Commodity Standards Division of the Office of Industry and Commerce, U. S. Department of Commerce, reported recently.

★ ★ ★

Proposed by the Copper and Brass Research Association, the recommendation lists preferred outside diameters or distances between parallel surfaces of rod ranging from 1/16 inch to 4 inches.

★ ★ ★

In the opinion of the sponsors, general adoption of the recommendation should result in steadier production, and the repetition of orders for similar sizes should in time permit the building of stocks, and thus regularize production and facilitate distribution.

★ ★ ★

Printed copies of Simplified Practice Recommendation R241-50, Copper and Copper-Alloy Rod (Round, Hexagonal, and Octagonal), may be obtained from the **Superintendent of Documents, Government Printing Office,** Washington 25, D. C., at 5 cents per copy. A discount of 25 percent will be allowed on orders for 100 or more copies sent to a single address.

★ ★ ★

Program For Protection of Technical Information

Secretary of Commerce Charles Sawyer has provided a service to help the public guard voluntarily against the harmful release of technical information, even though not subject to formal security restrictions.

★ ★ ★

The Office of Technical Services of the United States Department of Commerce will receive requests for advice as to whether specific technical data should be disclosed, withheld, or given limited distribution. OTS will obtain expert opinions from the interested departments and agencies of the Government

and inform the inquirer accordingly.

★ ★ ★

As an industrialist, businessman, scientist, public official, or private citizen, you are invited to use this service whenever you question whether technical information in your possession should be disclosed. It is then entirely up to you whether or not you act on the Government's advice. There is absolutely no compulsion for you to do so, since the program is entirely a voluntary one.

★ ★ ★

Requests for advice concerning the release of technical information, together with pertinent manuscripts, plans, or documents, if they are available, should be addressed to:

Office of Technical Services,
U. S. Department of Commerce,
Washington 25, D. C.

★ ★ ★

What Information Is Affected

The program of voluntary protection is not primarily concerned with information which is "classified" as restricted, confidential, secret, or top secret by the United States Government. Unauthorized disclosure of such information is forbidden under penalty of law. If a question exists whether certain information is classified, however, this OTS service is available to obtain specific advice.

★ ★ ★

It is primarily concerned with unclassified technical information and industrial and commercial information of a technological nature. Information falling within the scope of the program includes unclassified technical data on:

Advanced industrial developments.
Production "know-how" and technology.
Strategic equipment.
Special installations.

★ ★ ★

Circumstances in which voluntary protection is invited are somewhat broader than indicated by this listing. The public itself, through inquiries which already have been made of various Federal agencies, has showed its awareness of the dangers of divulging certain information. These inquiries illustrate certain categories of information regarding which the advice of the Government can prudently be sought.

KEYSTONE
TUBULAR RIVET
Wire

Keystone's special techniques and processing methods have produced a tubular rivet wire with *exceptional* forming qualities for both extruded and drilled rivets.

The wire for drilled tubular rivets has the proper hardness for longer drill life. The wire for extruded rivets has uniform metal flow qualities required in extrusion headers. Both types have just the right ductility for cold heading and excellent roll crimping.

Regardless of the performance demanded in your products, consult Keystone for the wire to meet your most exacting specifications.

Outstanding Personalities of the Wire Industry

Watts Moved to New Post By C. F. and I.

L. A. Watts' recent appointment as Assistant General Sales Manager of the **Wickwire Spencer Steel Division of The Colorado Fuel and Iron Corporation** was announced by H. C. Allington, General Manager of Sales at the Executive Offices of the Corporation in New York City.

★ ★ ★

Mr. Watts is a graduate of Northwestern University and a member of the Beta Theta Pi Fraternity. In 1938, Mr. Watts joined the then Wickwire Spencer Steel Company as a chemist in the Buffalo Plant. Since that date, he has held numerous positions, among them being foreman, assistant superintendent and metallurgist in the Buffalo Wire Mill. In 1947, he was appointed manager of the General Wire Sales Department. In addition to this duty, in 1949, he was selected to head the newly opened Detroit District Sales Office as Manager. He relinquished this managership in August of 1950. In the same year, he established and managed the Pig Iron and Semi-finished Sales Department.

★ ★ ★

He is being succeeded by R. M. Wagner but will continue to supervise and direct the Pig Iron and Semi-finished Sales Department.

★ ★ ★

In 1931, Mr. Wagner joined the then Wickwire Spencer Steel Company. Except for four years of service in the Armed Forces, his employment in the Corporation has been continuous. He has served in various capacities in the Chicago District Sales office and in the General Wire Sales office located in Buffalo, New York. His most recent position was that of Assistant Wire Sales Manager.

★ ★ ★

Standard Varnish Appoints Hart to High Post

M. H. Corbin, President of **Standard Varnish Works,** New York, has announced the appointment of Raymond F. Hart to the position of Assistant to The President.

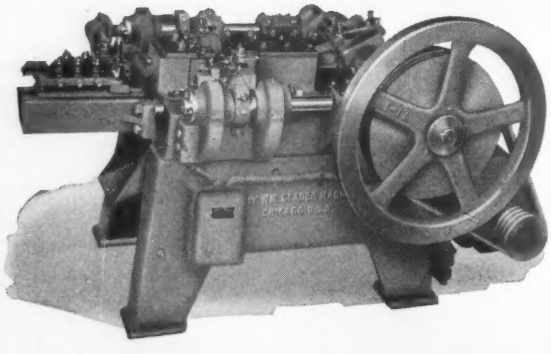
★ ★ ★

Mr. Hart has wide experience in the analysis of organizations and methods. His background includes service with private businesses and various government agencies. During World War II he was Chief of The Production Requirements Plan of The War Production Board and later was commissioned a Lieutenant in the Navy, performing the duties of contracting and expediting various phases of naval production.

★ ★ ★

As Assistant to the President of Standard Varnish Works, Mr. Hart's activities will be concerned with both the New York and the Chicago

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

operations of that company.

★ ★ ★

At the same time the Company also announced the appointment of **Arthur E. Kromer** as chief chemist of their trade sales division.

★ ★ ★

Jack Williams to Represent Syncro in Midwest

The Syncro Machine Company, manufacturers of wire drawing and cable making machinery, announce the appointment of **Jack P. Williams, Jr.,** as a Special Representative for the Midwest territory. Mr. Williams, who has been a manufacturers agent on the West Coast for the past several years, has moved his office to 20 North Wacker Drive, Chicago, Illinois, and from this location he will act as Special Representative for the sale of Syncro products in the Midwest area. Prior to World War II Mr. Williams covered this area for the Syncro Machine Company, and therefore is well-known by the wire and cable manufacturing industry located in the Midwest.

★ ★ ★

Cleveland Tramrail Sales Representation

Nelson J. Leonard, who has long represented **Cleveland Tramrail** overhead materials handling equipment in the State of Washington, has been granted a franchise to cover the entire Northwest Territory. Mr. Leonard's main office is located at 5764—28th Avenue N. E., Seattle 5, Washington.

★ ★ ★

Roebling Company Appoints New Sales Executives

Stuart E. Yeaton, general product manager, Electrical Wire Division of **John A. Roebling's Sons Company,** Trenton, N. J., announces the appointment of three new sales executives.

★ ★ ★

Howard E. Maloney was made manager of sales. He has been associated with the Roebling Company for the past nine years, starting as a salesman in the Seattle district office. In 1949 he transferred to the Division's main sales office in Trenton as assistant manager, the position he held until his recent appointment.

★ ★ ★

Frank T. Craven, a member of the electrical staff since 1936, was appointed assistant manager of sales. He was first employed as a salesman in the Philadelphia district office. For the past four years, he has been in charge of sales of coils, magnet wire, and bare and weatherproof products.

★ ★ ★

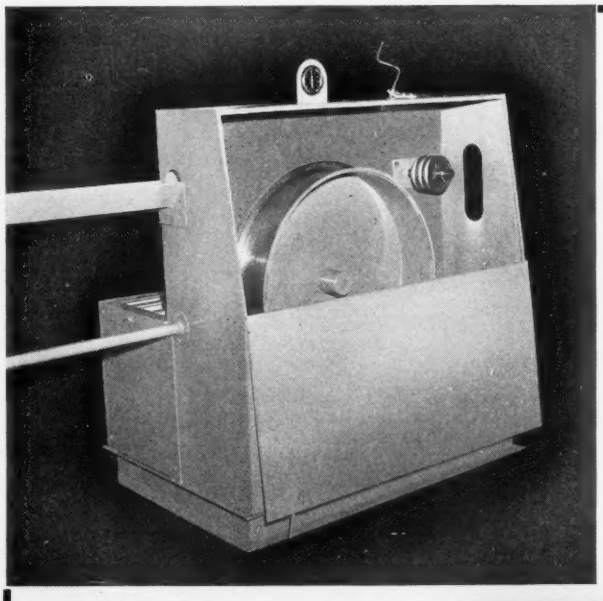
Roy H. Hainsworth became Eastern regional manager, with headquarters in Trenton. He joined the Roebling sales force in 1947, and has served in both the Denver and Chicago districts.

★ ★ ★

A. L. Chapman Elected Vice President of Sylvania

Arthur L. Chapman has been elected a vice president of **Sylvania Electric Products Inc.,** New York. He continues as manager of the radio and television division in Buffalo and its parts division in Warren, Pa.

★ ★ ★



FEDERAL
WIRE HANDLING
CAPSTANS

Designed for today's wide-range requirements. Heavy, rugged steel construction for durability and long life.

Speeds range up to 2500 .P.M. Have many unique features, all time-tried and mill proven, that makes possible superior performance.

Write today for descriptive literature.

FEDERAL CAPSTANS embody designs based upon practical mill experience and needs. Their superior performance and versatility will please you. They are economical and dependable.

Federal Manufacturing Co.
SPECIAL WIRE MACHINERY
236-240 Hall Avenue, Wallingford, Conn.

Allegheny Ludlum Steel Co. Appointments

Edward J. Hanley was recently elected president, and **Clark W. King**, executive vice president of **Allegheny Ludlum Steel Corp.**, Pittsburgh. Mr. Hanley succeeds **F. B. Cleborne**, resigned, but who continues as a director and vice president. **Frank B. Lounsberry** has retired as vice president and technical director, and **W. B. Pierce** becomes technical director. Mr. King succeeds Mr. Hanley.

★ ★ ★

New Manager Named for G.E.'s Chemical Department

Robert L. Gibson, of Pittsfield, Mass., has been named general manager of the General Electric Company's Chemical Department with headquarters in Pittsfield, it was announced recently by Ralph J. Cordiner, G-E president.

★ ★ ★

Formerly assistant general manager of the department, Mr. Gibson will be responsible in his new capacity to Harold F. Smiddy, G-E vice president in charge of the Chemical Department.

★ ★ ★

Charles Eisler Honored

Bloomfield College and Seminary, Bloomfield, N. J., has conferred the honorary degree of Doctor of Science on **Charles Eisler,** president of **Eisler Engineering Co., Inc.,** Newark, N. J., and inventor, designer and machine builder, for his "outstanding achievements in the incandescent lamp and radio tube industries."

★ ★ ★

Mr. Eisler is 66 years old and came to this country as a youth from Budapest, Hungary. He has been a member of the American Society of Mechanical Engineers for 35 years, and founded the company which bears his name in 1920. Previously, he had been with the Westinghouse Company, Bloomfield Division, as chief engineer of equipment. While there he designed and built the first universal coil winding machines in the United States. Mr. Eisler holds more than 50 important machinery patents which are in use throughout the world.

★ ★ ★

Whitehead Has New Baltimore Warehouse

T. M. Bohen, president of **Whitehead Metal Products Company, Inc.,** announced the removal of the Baltimore metal warehouse to enlarged and improved quarters at 4300 E. Monument Street, Baltimore, Maryland. This expansion was necessitated by an increased demand by Baltimore's industrial firms for corrosion resisting metals.

★ ★ ★

John W. Marple will continue to direct activities as resident branch manager.

★ ★ ★

J. M. Yahres, Elected President Pittsburgh Screw & Bolt

John M. Yahres, executive vice president of **Pittsburgh Screw and Bolt Corporation,** was elected president of the company on January 3rd, at a meeting of the board of directors.

Mr. Yahres, who succeeds the late John P. Hoelzel, joined the company in 1909. He became vice president in 1921 and was made executive vice president in 1937.

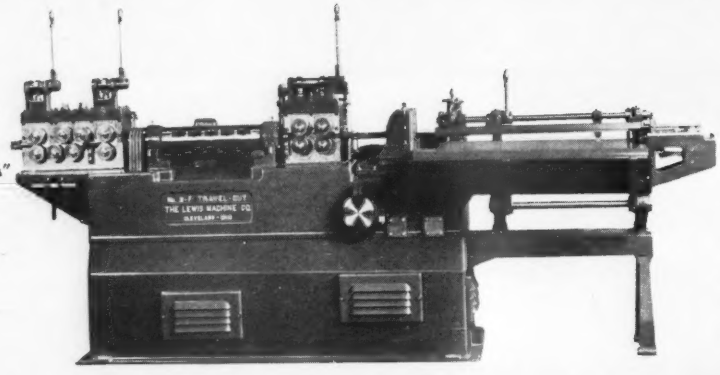
★ ★ ★

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS **TRAVEL-CUT**

MACHINES



22 Models to handle from 1/16" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL CUT. Full details on request.

Write for your pocket-size Wire Gauge Chart. No obligation.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California

CANADIAN: Empire Engineering Co., 11 Wellington St. E., Toronto 1, Ontario.

CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

Timberlake Heads J&L Sales

A. J. Hazlett, vice president in charge of sales for **Jones & Laughlin Steel Corporation,** announced recently that **John E. Timberlake** had been appointed general manager of sales. He was assistant general manager of sales prior to this appointment, which post is now occupied by **C. M. Merritt,** previously Detroit district sales manager.

★ ★ ★

Cambridge Wire Cloth Appoints New Officers

Cambridge Wire Cloth Co., Cambridge, Md., appointed the following new officers: Executive vice president, **Irwin F. Pink;** vice president and general manager, **Edward N. Evans;** secretary and treasurer, **Nina E. Pink.** Mr. Pink joined the company in 1920 and has been vice president and general manager since 1942. Mr. Evans was secretary-treasurer.

★ ★ ★

Kennecott Wire & Cable Co. Elects A. F. Sheldon, President

Alan F. Sheldon, formerly vice president and general manager, was elected president of **Kennecott Wire & Cable Co.,** Phillipsdale, R. I., a subsidiary of Kennecott Copper Corp. He succeeds **Robert L. Coe,** retired.

★ ★ ★

John Hoelzel

John Hoelzel, president of the **Pittsburgh Screw & Bolt Company** died December 26th following a stroke. He was 68. Mr. Hoelzel joined the company more than 50 years ago. He became president in 1939 having been vice president in charge of sales. In addition to his wife, he is survived by two daughters, Mrs. Thomas Dewart, wife of the last president of the late **New York Sun,** and Mrs. William Evans, Cleveland, O., wife of the president of the Diamond Alkali Co.

★ ★ ★

Harry J. Denby

Harry J. Denby, president of **Denby Wire and Iron Company,** Cleveland, Ohio, manufacturers of wire mesh work, died on December 1, 1950, at the age of 57. Mr. Denby had organized the company with his father in 1917. From modest beginnings, the business had grown over the years to substantial proportions.

Glass Fibers Moving Offices to Toledo

Glass Fibers, Inc. plan to occupy new offices; for executive, administrative and sales staffs of the company early in March.

★ ★ ★

The new quarters, now being readied for occupancy, will include a display room where prime end products made of glass fiber will be shown.

★ ★ ★

Present offices are now in the company's plant at nearby Waterville.

★ ★ ★

Bulletin on Wire Winders

Standard Mill Supply Company, 1064 Main St., Pawtucket, R. I., has had printed a new 8 page bulletin describing the Standard Uni-Drive Wire Winder and payoff attachment made for them. This bulletin gives complete details on the machines, their operation and on all parts that may be needed. You are invited to send for a copy of this valuable bulletin.

★ ★ ★

[illegible] Made of solid nylon impregnated with diamond abrasive in grades from 1–5 microns to sieve size of 100. The nylon provides a cushioning effect to keep chips from tearing out of their sockets.

[illegible] LIFE Hartford Special Diamond Belts are impervious to humidity and oil, which allows the use of light oil as a coolant. They can be cleaned merely by washing in soap and warm water.

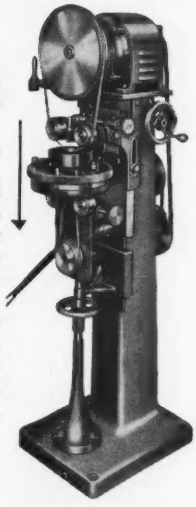
STRENGTH The solid nylon provides Hartford Special Diamond Belts with a tensile strength and wearability far superior to other types of belt. Tests have shown them to outlast other belts by as long as twenty times.

COLOR CODED Five different colors indicate grades of abrasive for easy identification. Available in lengths of 75 and 104 inches. Widths range from 1/8 to 3/8 inches.

DIE POLISHER

Polishes with line of draw

The Hartford Special Die Polisher utilizes an endless abrasive belt driven at grinding wheel speed which polishes dies parallel with the line of draw of work through the die. This method imparts a finer finish to the work, reduces upkeep and increases die life.



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HARTFORD *Special*
...the best buy in the long run

THE HARTFORD SPECIAL MACHINERY CO.
287 Homestead Ave., Hartford 12, Conn.

Please send me free Bulletin PM-100 describing your Die Polishing Machine and new Diamond Belts.

Name _____ Post _____
Company _____
Street _____
City _____ Zone _____ State _____

New "Wardwellian" Catalog

The Wardwell Braiding Machine Company, Central Falls, R. I., has just had prepared a new 34 page catalog describing the braiding machines for which this company is famous. It covers their 12 carrier rapid braider, the 16, the 16-16 (double-deck), 24, 16-24 (double-deck), and their paper, tape, asbestos and armor serving machines. In all, 15 different machines are illustrated and described in detail. Concerns with braiding and serving problems should have this new catalog on file. Please write for a free copy.

★ ★ ★

Houghton's Hi-Temp Oils

The results of an 18 months' research program of high temperature lubrication form the basis of a folder on "Hi-Temp Oils" recently issued by **E. F. Houghton & Co.,** 303 W. Lehigh Ave., Philadelphia 33, Pa. The leaflet describes the testing procedure used by Houghton's research staff in setting up the following three series of Hi-Temp Oils to meet all high temperature conditions up to and even over 500° F.

★ ★ ★

100 series—Straight mineral oils. Highly refined, these oils have high flash and fire points, low carbon content and are extremely stable. They leave a minimum of residue.

★ ★ ★

200 series—Semi-synthetic lubes composed of oils of varying viscosities to which has been added a synthetic organic compound with the ability to lubricate at temperatures far beyond that possible with straight mineral oils. The synthetic material provides lubrication long after the carrying oil has vaporized.

★ ★ ★

300 series—Colloidal graphite in light volatile carrying oil. Vaporizing of the light oil leaves a protective graphite film, which provides lubrication up to 1000° F.

★ ★ ★

New Manual Gives Newest Labor Relations Techniques

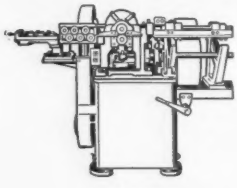
A new manual "LABOR RELATIONS WORK KIT" was published in December by the National Foremen's Institute, Inc., New London, Conn. As the introduction mentions, the manual is designed to put the labor relations and personnel man in touch with some of the more successful techniques worked out by outstanding companies who, when faced with a particular problem, have come up with a workable solution. In this manual you will find no theory or long expositions on probability. Instead, you'll more likely find the name of the company which worked out the individual or collective problem, together with the step-by-step "how to do it" procedure—often with visual illustrations.

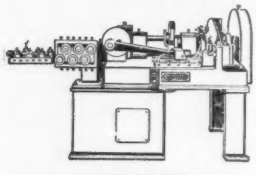
★ ★ ★

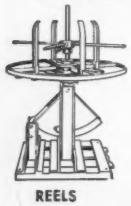
Further there are enough "know how" tips and aids, ideas and leads in the experiences of others to improve any labor relations or personnel practice program.

★ ★ ★

The LABOR RELATIONS WORK KIT is edited by Lawrence Stessin with the assistance of the Staff of the Employee Relations Bulletin. Published by the National Foremen's Institute, Inc.; over 200 pages. Price $7.50.

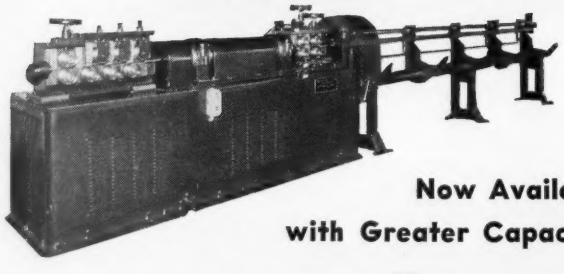

FLAT STOCK STRAIGHTENERS


SLIDE FEED STRAIGHTENERS


REELS

WIDEST RANGE STRAIGHTENERS BUILT

"SHUSTER"



Now Available with Greater Capacity!

Type 3A now straightens wire from ¼" to ½" dia., 9/16" in basic wire. Shuster machines handle wire from .025 to 11/16" dia. Write us your requirements.

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132W Lawrence St. New Haven, Conn.

Representatives in all principal cities and foreign countries.

SHUSTER Automatic Since 1866 WIRE STRAIGHTENING AND CUTTING MACHINES

A Review of Recent Wire Patents

NO. 2,532,407, CORROSION INHIBITING COMPOSITIONS, patented December 5, 1950 by Sven Christian Johansson, Goteborg, Sweden.

To coating compositions for iron etc., the inventor adds an alkali salt of either nitromethane, nitrothane or nitrophenylnitromethane in a minor amount.

★ ★ ★

NO. 2,532,640, PROCESS OF ENAMELING, patented December 5, 1950 by Wilbur H. Pfeiffer, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware.

Bare iron or steel is heated in a non-oxidizing atmosphere at a temperature of at least 1400° F. for at least a half hour to remove gases in the iron and steel and the iron and steel is then cooled in a non-oxidizing atmosphere to room temperature and thereafter a milled white porcelain enamel coating in the form of a liquid suspension is applied directly to the surface of the bare iron and steel, this coating is then dried and the coated iron and steel is heated at a temperature of at least 1500° F. for at least two minutes to provide a fused white porcelain enamel coating.

★ ★ ★

NO.2,533,301, PREVENTION OF RUST, patented December 12, 1950 by Franklin M. Watkins, Flossmoor, Ill., assignor to Sinclair Refining Company, New York, N. Y., a corporation of Maine.

Rusting of iron and steel is inhibited by maintaining a suitably concentrated petroleum oil distillate solution of cyclohexylamine mahogany sulfonate in contact with the metal, the petroleum oil distillate being gasoline, kerosene or fuel oil.

★ ★ ★

NO. 2,533,302, PREVENTION OF RUST, patented December 12, 1950, by Franklin M. Watkins, Flossmoor, Ill., assignor to Sinclair Refining Company, New York, N. Y., a corporation of Maine.

Here there is maintained a suitably concentrated petroleum oil distillate solution of p-aminophenol mahogany sulfonate in contact with the metal, the petroleum oil distillate being gasoline, kerosene or fuel oil.

★ ★ ★

NO. 2,533,325, METHOD AND MEANS FOR MAKING CHAINS, patented December 12, 1950, by Ivan O. Miller, Fullerton, Wayne N. Sutliff, Whittier, and Donald U. Shaffer and Kenneth E. Waggener, Brea, Calif., assignors to Shaffer Tool Works, Brea, Calif.

There are twenty-five claims in this patent for forming chains from bar stock.

★ ★ ★

NO. 2,533,439, METHOD OF MAKING COATED WIRE SCREEN CLOTH, patented December 12, 1950 by Flint C. Elder, Cleveland Heights, Ohio, assignor to the American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Open mesh wire screen cloth is made by coating metal screen wire about .011 inch in diameter with a film of organic thermoplastic resin about .002 inch thick, forming warp sheds thereof, interweaving therewith a weft of this wire and, after the weft wire has been fed between the sheds, beating it into the fell of the resulting cloth under pressure sufficient partially to displace the films on the warp and weft wires adjacent their intersections and form mutually interlocking depressions in the contacting surfaces thereof.

★ ★ ★

NO. 2,533,460, MANUFACTURE OF ELECTRIC CABLES, patented December 12, 1950 by Alfred J. Huck, St. Louis, Mo., assignor to Knapp-Monarch Company, St. Louis, Mo., a corporation of Delaware.

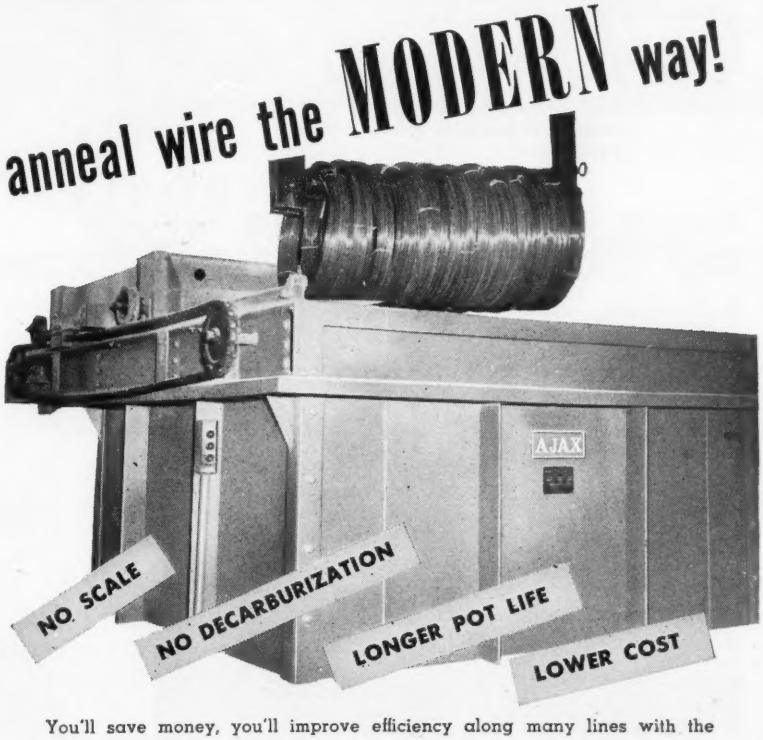
A resistance wire is wound about a core by the machine by two devices, at least one being variable, which machine also includes a resistance measuring device for the resistance between two points of the wire wound on the core, and a device for changing the variable device in the proper direction and in proportional relation to the deviation of the resistance measuring device from a desired value.

★ ★ ★

NO. 2,533,606, WIRE GAUGE, patented December 12, 1950 by Alfred G. Natzke, New York, N. Y., assignor to Lamar Slide Fastener Corp., New York, N. Y., a corporation of New York.

The gauge is for gauging the alinement of the head projections and the head

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.



You'll save money, you'll improve efficiency along many lines with the unique Ajax Electric Salt Bath wire annealing method. It requires less floor space, less labor, less maintenance. Heating cycles average less than 20 minutes, even on difficult jobs. There is no scaling, no decarburization, no explosion hazard, none of the bothersome problems entailed with atmosphere equipment. Salt bath treating does the work faster, better, cheaper!

Ideal for annealing low- or high-carbon and stainless steel wire and rod; annealing aluminum, and copper and silver alloys; and for descaling stainless and alloy steel wire in molten salt baths.

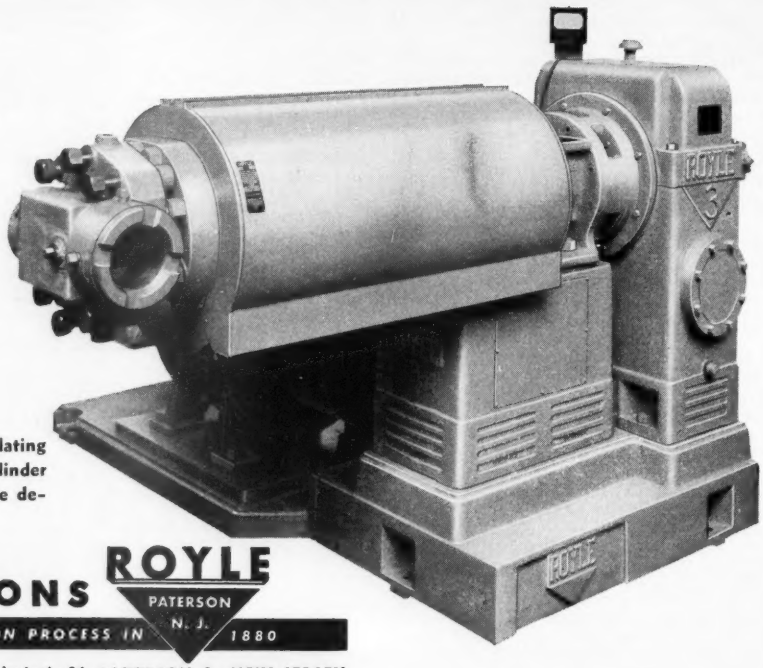
AJAX ELECTRIC COMPANY, INC.
Frankford and Delaware Aves. · Phila. 23, Pa.
The World's Largest Manufacturer of Electric Heat Treating Furnaces Exclusively

WRITE FOR YOUR COPY!
This 72-page Ajax booklet tells the entire story of salt bath heat treatment as applied throughout modern industry. Ask for Booklet 116.

AJAX HULTGREN ELECTRIC SALT BATH FURNACE

ROYLE *for WIRE INSULATING*

- Continuous Vulcanizing Machines for Rubber Wire Insulation
- Plastic Wire Insulation Machines
- Strainers • Cooling Troughs
- Light Wire & Cable Capstans
- Motorized Take-Ups
- Temperature Control Units for Extrusion Processes and other industrial uses



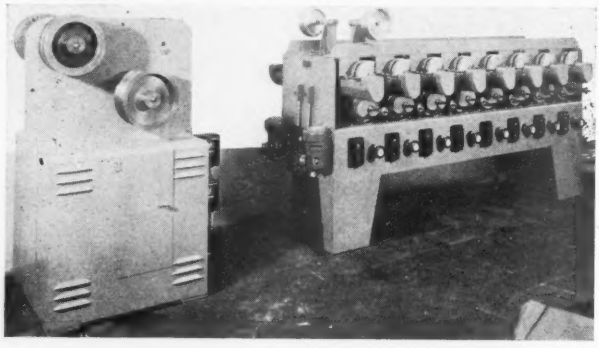
ROYLE # 3 Plastic Wire Insulating Machine. Double extended cylinder enclosed in insulating jacket, side delivery head.

JOHN ROYLE & SONS — ROYLE, PATERSON, N. J., 1880

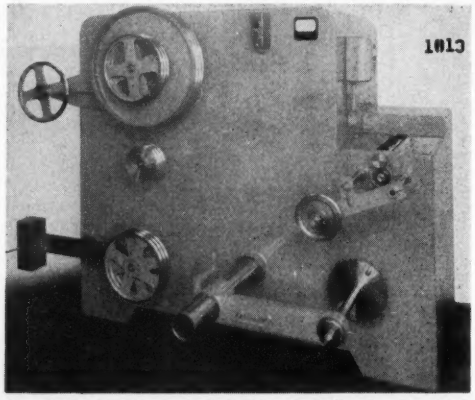
PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. — REgent 2430
Home Office — J. W. VanRiper — SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter — JEfferson 3264
Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

PATERSON 3, NEW JERSEY



No. 966—Torque Motor Take-Up with Capstan



No. 1013—Capstan and Take-Up Reel-Stand. Constant Speed, Constant Tension Throughout Reel Build-Up. For Use Behind Extruding Machines. Also Built for Continuous Take-up, with Wire Transfers and Two Reels.

EST. 1855 — AIMCO — INC. 1915

"American" INSULATING MACHINERY COMPANY

REG. U.S. PAT. OFF.

517 West Huntingdon St.
Zone 33

PHILADELPHIA PENNSYLVANIA U.S.A.

WIRE DRAWING, ENAMELING, TINNING, INSULATING, TAPING, GLASS-COVERING, PANNING, AND ALLIED MACHINERY.

recesses of connected slide fastener embryo scoops, which projections and recesses are produced on opposite sides of a continuous length of wire by deformation thereof.

★ ★ ★

NO. 2,534,469, BAIT RETAINING FISHHOOK, patented December 19, 1950 by Charlie A. Moore, Victoria, Tex.

The fishhook is of two sections of bent wire providing two barbs.

★ ★ ★

NO. 2,535,284, COLD-DRAWING STEEL WIRE, patented December 26, 1950 by Arch W. Harris, Euclid, Ohio, assignor to the American Steel and Wire Company of New Jersey, a corporation of New Jersey.

A method of cold-drawing is disclosed and comprises annealing scale-free wire in a reducing atmosphere at a temperature between 1450° and 1900° F. and then, without exposure to oxidizing influences, immediately quenching the annealed wire in a lead bath containing lead oxide maintained at a temperature between 800° and 1100° F. to produce a film of ferrous oxide thereon, and cold drawing the wire with this film thereon.

★ ★ ★

NO. 2,535,328, HOOK FORMING APPARATUS FOR RODS AND WIRE, patented December 26, 1950 by Thomas S. Somerville, Monongahela, Pa., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

This apparatus comprises a cylinder rotatably mounted in a housing, which is provided with a housing cap. There are also a hook mandrel and a holding mandrel fastened to the cap and extending into the cylinder, these mandrels being spaced apart to permit insertion of the rod therebetween, and a roller mounted in the cylinder for movement therewith, the axis of the roller being parallel to the cylinder axis, the roller being adapted to contact the end of the rod and bend it around the hook mandrel when the cylinder is rotated.

Coppercoating Described in Booklet

A product called FLUIDOX is described in a booklet issued by The **Techema Corporation,** 1200 Niagara St., Buffalo 13, New York and 765 Kingston Road, Toronto, Canada. "Fluidox" is applied to the wire before drawing and produces a coating that will not scale or come off in subsequent drawing, as well as not being subject to dark spots.

★ ★ ★

The coppering treatment is simple and economical. For every ton of finished wire only one pint of "Fluidox" is used. The treatment is good where tinning, galvanizing and enamelling are to be done and the coating of copper also facilitates wire drawing.

★ ★ ★

The booklet, containing complete directions for its use, will be sent free to anyone requesting it. Send inquiries to either address.

★ ★ ★

New Fiberglas Plant

Arrangements have been completed for building a new Fiberglas yarn manufacturing plant in Anderson, South Carolina, Harold Boeschenstein, president of Owens-Corning Fiberglas Corporation, said in January.

★ ★ ★

Excavation work and site grading are starting immediately. Production will begin about the middle of 1951 with an initial working force of approximately 200 employees, most of whom will be recruited from the Anderson area.

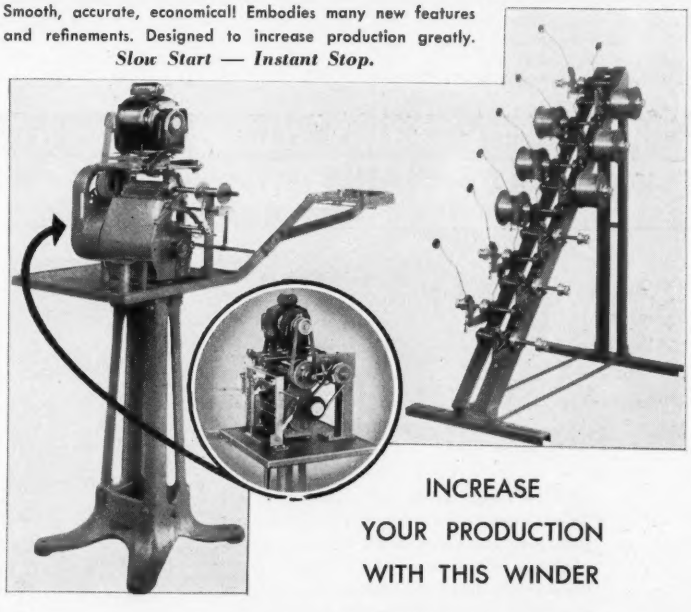
★ ★ ★

Fiberglas yarns are used widely as a base for electrical insulation to reinforce plastics, paper, tape and certain industrial rubber products, as well as for a wide variety of consumer products. The rapidly expanding demand for Fiberglas yarns made this expansion project at Anderson necessary.

★ ★ ★

STANDARD UNI-DRIVE WIRE WINDER.

Smooth, accurate, economical! Embodies many new features and refinements. Designed to increase production greatly.
Slow Start — Instant Stop.

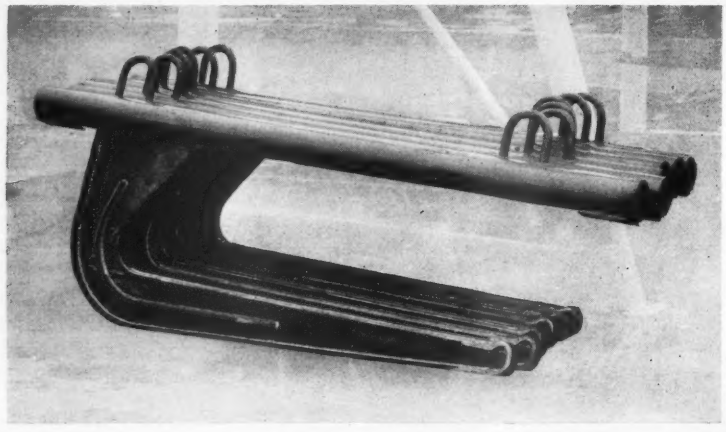


INCREASE
YOUR PRODUCTION
WITH THIS WINDER

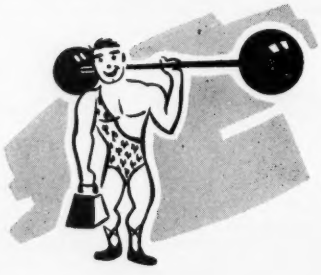
PAYOFF
Our payoff attachment is made with self-aligning ball bearings and a compensating attachment to control the tension of each end. Applies same tension when spool is empty as when full.

Some outstanding features are: elimination of main drive belts; traverse adjustable to various distances between spool heads—from 1⅜" to 5½"—without changing cam; winds up to 12 ends of wire on each spool; winds ends evenly in flat ribbon in perfect alignment with spool heads; each strand of wire lays parallel to the next with no under-winding, over-winding, tight or loose spaces; starts gradually; driven by ¼ H. P. A. C. 110 volt, 60 cycle, single phase motor.

STANDARD MILL SUPPLY
PAWTUCKET, R.I., 1064-1080 Main St.
NEW YORK, N.Y., 6708 Empire State Bldg.
CHARLOTTE, N. C., 2319 Hutchison Ave.



designed for
HEAVY-DUTY
service . . .



WELDCO Lightweight *Hairpin* Hooks

● These Weldco lightweight Monel pickling hooks are now in use in a New York wire mill, where they replaced bulky, old-style equipment. The hooks are 10' 8" long, and handle up to 3,000 pounds each; they're so corrosion-resistant that, although they are used constantly in hot 7½% sulphuric acid, they outlast heavy cast hooks 2 to 3 times.

Wire mills throughout the country prefer Weldco hairpin hooks because of their lightweight, toughness, corrosion-resistance, and long service life.

Why not find out what these economical, heavy-duty pickling hooks can do for your plant? Write, phone, or wire us today.

THE YOUNGSTOWN WELDING & ENGINEERING COMPANY
OAKWOOD AVENUE — YOUNGSTOWN 9, OHIO

The *SPECIALISTS* in Wire-Straightening and Wire-Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

●

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
- Florist Wire

Write us today!

Manufacturers of the famous ARMA PAPER CLIP

PITTSBURGH CUT WIRE COMPANY
1112-20 GALVESTON AVENUE · PITTSBURGH, PENNSYLVANIA.
TELEPHONE: CEdar 4702

New Post Occupied by A. F. Dill

Alan F. Dill was promoted to the newly-created post of defense regulations coordinator for the **American Steel & Wire Company,** it has been announced by Walter F. Munford, vice president of operations of the U. S. Steel subsidiary.

★ ★ ★

In his new position in the Production Planning Department, Mr. Dill will receive regulations issued by the Office of Defense Mobilization and interpret their effect on the Wire Company's operations in 14 plants located in nine cities ranging from Duluth, Minn., to Trenton, N. J.

★ ★ ★

Wall-Hanger on Tungsten Carbide Offered by Metal Carbides

Metal Carbides Corporation, Youngstown, Ohio, announces an attractive new plastic wall hanger, 9 x 12 inches, showing and describing how tungsten carbide metal is made. It will be sent free-of-charge to any customer or prospect. Suitable for hanging on wall or standing on a desk anywhere, in the shop office or executive suite, the plaque explains graphically and completely the steps in prepartaion of tungsten carbide metal by either the Hot Press metal or the Cold Press method.

★ ★ ★

This is the first time in the history of the carbide industry that a clear and easily understood explanation of the manufacturing processes has been made available. Interested persons should address requests to Department D, Metal Carbides Corporation, Youngstown, Ohio.

★ ★ ★

Surface Combustion Starts New Heat Treat Bulletin

A new publication, designed to present current technical and operating information on heat treating metallurgy and practice, has been instituted by **Surface Combustion Corporation,** Toledo, Ohio.

★ ★ ★

This bulletin, entitled the "Heat Treat Review", is to be published periodically by Surface Combustion and distributed to all persons concerned with heat treating operations. The magazine is intended to provide up-to-date information on heat treating processes as applied to all phases of the metal-working field. Metal melting and related metal processing activities are also to be covered in this bulletin.

★ ★ ★

Industrial metallurgists and heat treaters are offered this magazine on a gratis basis by writing on their letterhead to the Editor, HEAT TREAT REVIEW, Surface Combustion Corporation. Toledo 1, Ohio.

★ ★ ★

The Chemical Formulary

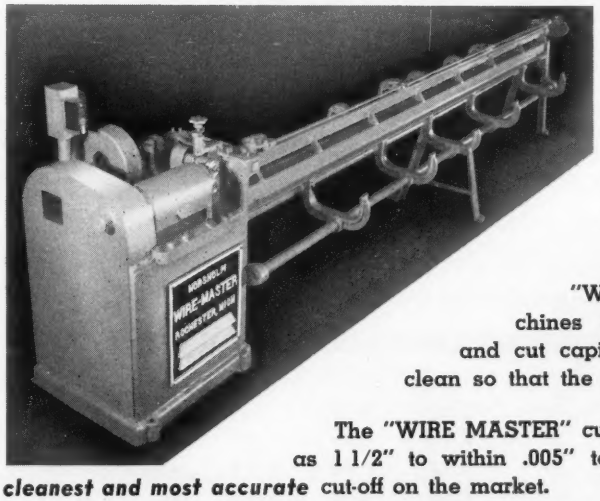
The ninth Edition of The Chemical Formulary is a new book that has just been put out by the **Chemical Publishing Company.** This book is strictly new, with not one formula contained in the previous eight editions repeated.

★ ★ ★

It has been compiled by 22 of the country's leading industrial research chemists, each an expert in his own field. Every formula given represents long years of research and millions of dollars spent on experiments

Faster, More Accurate
STRAIGHTENING and CUTTING
with the
NORSHOLM "WIRE MASTER"

So fast, a customer is finding that *two* machines will do the work of *six* machines formerly used.



Model A, shown, will handle .040" to .156" wire.

Other models will handle up to .312"Stock,round.

NORSHOLM "WIRE MASTER" machines will also straight- and cut capilliary tubing. Cuts clean so that the hole is not closed.

The "WIRE MASTER" cuts lengths as small as 1 1/2" to within .005" tolerances, with the ***cleanest and most accurate*** cut-off on the market.

IT'S RUGGED, VIBRATIONLESS, FAST!

As to speeds, 180 to 200 F.P.M. is the minimum to be expected. Your cutting jobs will be studied and speeds ***guaranteed.***

Write today for information on these remarkable machines

NORSHOLM INDUSTRIES
370 WEST AVON RD. • ROCHESTER, MICH.

that have led to these tested formulae.

★ ★ ★

Practically every phase of industry is covered, including adhesives, ceramics, cements, lubricants, lacquers, varnishes, resins, plastics, waxes, cleaners and many other products. The book contains 599 pages of formulae and chemical data and sells for $7.00. Copies may be ordered through WIRE AND WIRE PRODUCTS, 300 Main Street, Stamford, Conn.

★ ★ ★

New Diamond Abrasive Belts for Die Making

The Hartford Special Machinery Co., Hartford 12, Conn., announces the development of a revolutionary new diamond abravise belt for use on carbide dies from ¼" to 9" I.D. These belts are made of solid nylon impregnated with diamond abrasive in grades from 1-5 microne to a sieve or mesh size of 100.

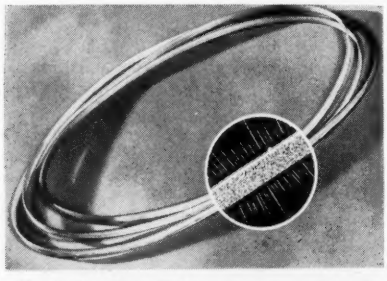
★ ★ ★

The resilience of the nylon provides a cushioning effect against shock and prevents the diamond chips from tearing out of their sockets. Tests have shown that these diamond belts have outlasted other diamond belts by as long as twenty times.

★ ★ ★

The belts are not affected by humidity and can be cleaned simply by washing in warm soap and water. They are impervious to oil, allowing the use of light oil as a coolant. In many cases broken belts which are still usable can be rejoined without decreasing effectiveness.

★ ★ ★



Hartford's New Belt * * * *

A special feature of the Hartford Special diamond belt is its "color coding." The color of the nylon belt indicates the abrasive size. At present five different colors are being used.

★ ★ ★

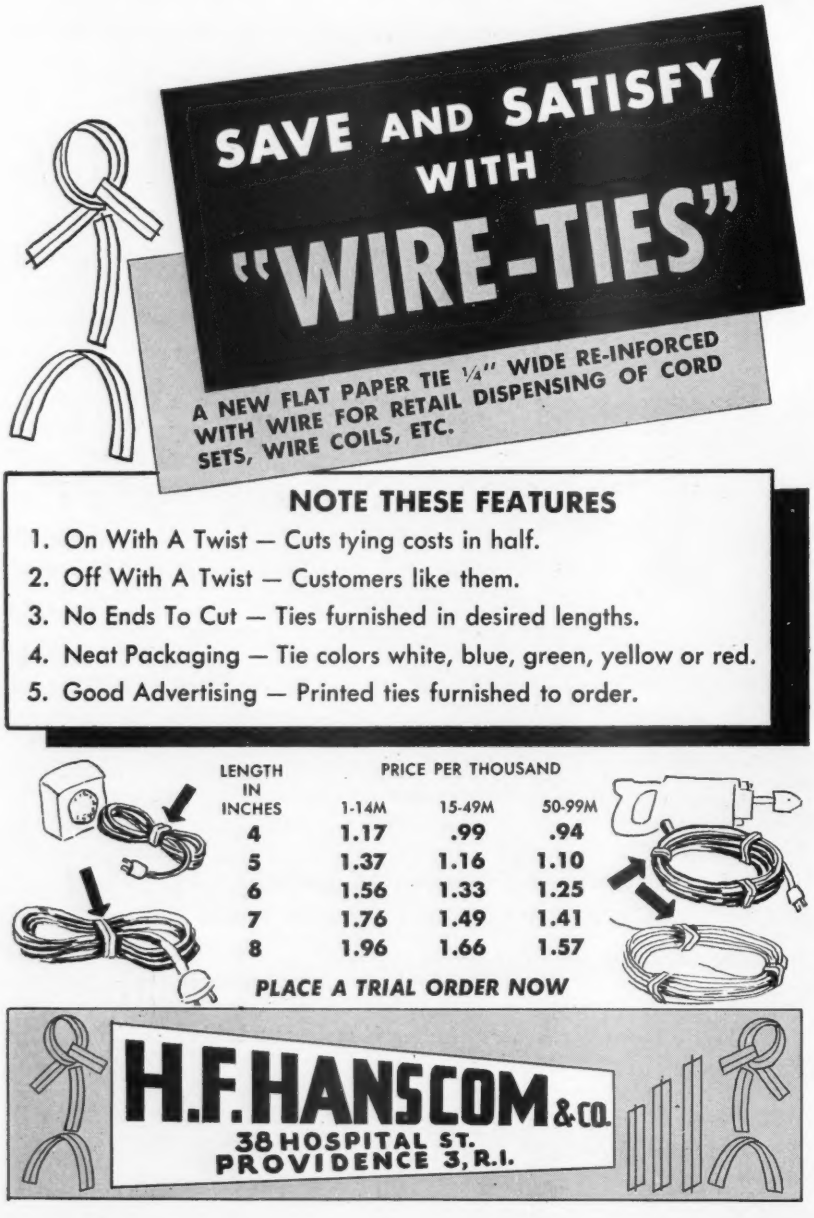
Hartford Special diamond belts are available in standard lengths of 75 and 104 inches. Standard widths in the smaller size are ⅛, 3/16 and ⅜ inches, while the longer belts come in widths of 3/16, 5/16 and ⅜ inches. Special lengths, widths and grits can be furnished to specifications. Die polishing machinery for use with these belts are also made by the company.

★ ★ ★

New Belt Developed by U. S. Rubber

The L. H. Gilmer Division of the U. S. Rubber Company is offering a new belt, the product of 12 years of development work. Called the Gilmer Tinning Belt, it is formed with teeth to provide a positive drive requiring no lubrication, yet that is undamaged by oils or water.

★ ★ ★


SAVE AND SATISFY WITH "WIRE-TIES"
A NEW FLAT PAPER TIE ¼" WIDE RE-INFORCED WITH WIRE FOR RETAIL DISPENSING OF CORD SETS, WIRE COILS, ETC.
NOTE THESE FEATURES
1. On With A Twist — Cuts tying costs in half.
2. Off With A Twist — Customers like them.
3. No Ends To Cut — Ties furnished in desired lengths.
4. Neat Packaging — Tie colors white, blue, green, yellow or red.
5. Good Advertising — Printed ties furnished to order.
LENGTH IN INCHES
PRICE PER THOUSAND
1-14M
15-49M
50-99M
4 1.17 .99 .94
5 1.37 1.16 1.10
6 1.56 1.33 1.25
7 1.76 1.49 1.41
8 1.96 1.66 1.57
PLACE A TRIAL ORDER NOW
H.F. HANSCOM & CO.
38 HOSPITAL ST.
PROVIDENCE 3, R.I.

Because it is reinforced with steel wire cables and Fiberglas cords, it is free from stretching, is exceptionally strong and flexible and can be operated at speeds as high as 12,000 F.P.M. It is made in sizes that meet any power requirements. No tension mechanism or adjustments are required.

★ ★ ★

Exposure Test Program

The American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., has issued an illustrated bulletin entitled, "Exposure Test Site Program", describing their program to determine the effects of atmospheric deterioration or corrosion on plastics, textiles, rubber, metals, etc.

★ ★ ★

Facilities for testing materials are described, which include galvanized wire of various coating thicknesses and processes of application.

★ ★ ★

For a copy of this, please write the Society requesting ASTM Bulletin No. 167.

★ ★ ★

THE WIRE ASSOCIATION ATTENDANCE AT THE OCTOBER, 1950 CONVENTION LORD BALTIMORE HOTEL, BALTIMORE, MARYLAND

ABRAMS, J. H., Sales
American Chemical Paint Co.
Ambler, Pa.

ADAMS, W. C., Process Eng.
Titan Metal Mfg. Co.
Bellefonte, Pa.

AINSLEY, Edward J., Research Chem.
Oakite Products Inc.
22 Thames Street
New York, N. Y.

ALDEN, John H., Asst. Chief Met.
Aluminum Co. of America
Gulf Bldg.
Pittsburgh, Pa.

ANJESKEY, A. F., Sales Mgr.
Cleveland Tramrail Div.,
Cleveland Crane & Eng'g Co.
Wickliffe, Ohio

ANDERSON, Frank N., Supt.
The Gilbert & Bennett Mfg. Co.
Blue Island, Ill.

ANDERSON, Roger M., Plant Supt.
Johnson Steel & Wire Co.
Akron, Ohio

ANDRION, Virgil C., Foreman
Reid Avery Company
Dundalk, Maryland

ARMSTRONG, Charles W. Pro. Eng.
C. O. Jelliff Mfg. Corp.
Southport, Conn.

ATKINSON, Lawrence, Works Mgr.
Frost Steel & Wire Co., Ltd.
Hamilton, Ontario, Canada

AVEDESIAN, Andrew G., Sales Mgr.
American Carbide Die Co.
Union City, N. J.

AVISON, M. D., Gen. Mgr.
Ramsden Camm & Co., Ltd.
Brighouse, Yorkshire, England

AYRES, Robert F., Research Chem.
Oakite Products Inc.
22 Thames Street
New York, N. Y.

BAESSLER, Karl H., Works Mgr.
California Wire Cloth Corp.
1089-19th Avenue
Oakland, Cal.

BAILEY, John B., Sales
Bethlehem Steel Company
Baltimore, Maryland

BAILEY, R. O., Sales
American Chemical Paint Co.
Ambler, Pa.

BAKER, E. G., Wire Met.
Steel Company of Canada Ltd.
Hamilton, Ontario, Canada

BARUS, Phillip C., Gen. Mgr.
Draw Alloy Company
370 Wheatfield Street
York, Pa.

BAUGHMAN, H. E., Asst. Works Mgr.
Detroit Steel Corp.
Portsmouth, Ohio

BAWDEN, William D., Asst. Supt.
The Gilbert & Bennett Mfg. Co.
Georgetown, Conn.

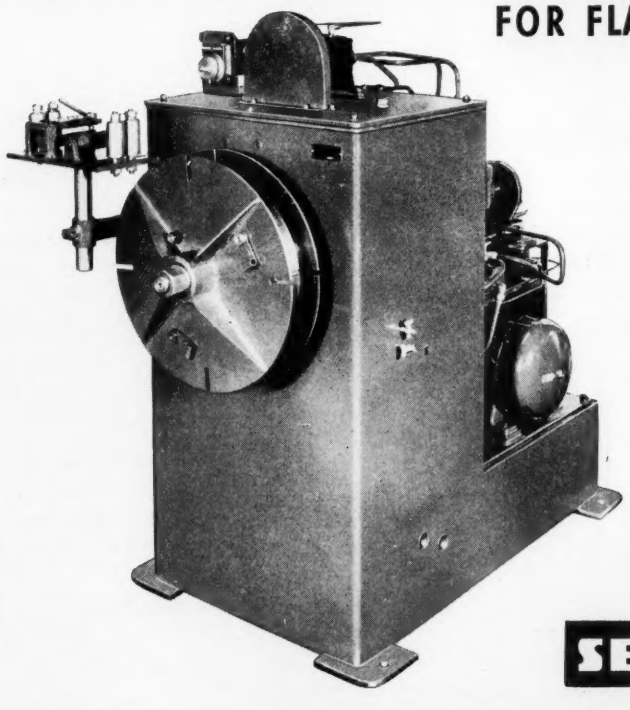
BECKER, Jurgen Echter, Supt.
Westfalische Drahtindustrie
Hamm, Germany

BECKER, Paul W., Plant Mgr.
Electric Auto-Lite Co.
Hazleton, Pa.

Hydraulically Operated

TRAVERSE REELS

FOR FLAT WIRE AND NARROW STRIP



• The self-contained, compact SECO Traverse Reel has smooth, powerful hydraulic operation — at speeds from 150 to 600 feet per minute.

PERFECT SPEED CONTROL from zero to top running speed through flow control.

ACCURATE TENSION CONTROL through pressure regulation.

Built in sizes for coils weighing up to 600 lbs., for round or flat wire. Unit shown occupies floor space 24" x 42". Modifications in design and construction to meet specific requirements.

WIRE SPOOLERS

Single and Multiple Type

Speeds Up to 4,000 feet per minute

STEEL EQUIPMENT CO.

SECO

2890 EAST 83rd STREET

CLEVELAND 4, OHIO

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Lebanon, Pa.

BENEKE, Charles J., Prod. Mgr.
Reynolds Metals Co.
3317 Linnet Road
Louisville, Kentucky

BENNER, Henry L., Pres.
American Insulating Machinery Co.
Fairhill & Huntingdon Sts.
Philadelphia, Pa.

BENNETT, J. C., Pres.
Wm. Crabb & Company
Black Mountain, N. C.

BERRY, Robert V., Sales
Indiana Wire Die Company
314 Wallace
Fort Wayne, Ind.

BERTOTTI, J. M., Field Sales Mgr.
Carboloy Company
Detroit, Michigan

BIEBERICH, Dwight
Fort Wayne Wire Die Inc.
Fort Wayne, Ind.

BIERVLIET, E. E., Van, Eng.
Trefileries, Leon Bekaert
Zwevegem, Belgium

BIERWAGEN, R. W., Mgr. Copper Dept.
Westinghouse Electric Corp.
Buffalo, N. Y.

BILLERBECK, WM. J. Jr., Con. Eng.
American Insulating Machinery Co.
Fairhill & Huntingdon Sts.
Philadelphia, Pa.

BINNS, Harold, Chief Draftsman
Revere Copper & Brass Inc.
1301 Wicomico Street
Baltimore, Maryland

BLACK, Everett E.
Die Shop Formean
John A. Roebling's Sons Co.
Roebling, N. J.

BLETSO, Bruce, N., Equip. Eng.
American Steel & Wire Co.
Rockefeller Bldg.
Cleveland, Ohio

Serving the...

Insulated and Bare Wire Industries All Over The World With ...

Wire Sparkers and Accessories
Electrode Units
Hand Locaters
Automatic Reelers, Coilers, Spoolers and Re-Spoolers
Reel Take-Ups
Collapsible Coiling Reels
Measuring Machines
Pay-Off Reel Stands
Pneumatic Disk Brakes
Pneumatic Cylinders, Valves and Controls
Wire Marking Machines
Wire Labelling Machines
Wire Pre-Heater
Insulation Patching Press
Traverse Mechanisms
Slip Clutch Drives
Retail Wire Dispenser
Hydraulic Cable Cutters
Take-up, Measuring and Pay-Off Equipment for Warehouse Use

(See Page 126 For News Of A New Type Marking Machine!)

JAMES L. ENTWISTLE CO.
43 Church Street, Pawtucket, Rhode Island, U. S. A.
30 YEARS OF SERVICE TO THE WIRE INDUSTRY

European and South American Agents:
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150 BROADWAY, NEW YORK 7, NEW YORK

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GENERAL ENGINEERING CO., LTD.
BURY ROAD, LANCS., ENGLAND

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Hubbard Spool Company
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BOWERS, Earl, Ind. & Sales Eng.
Standard Industrial Compounds Co.
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Chicago, Ill.

BOYER, W. J., Chief Chemist
Armco Steel Co.
Rustless Div.
3400 E. Chase Street
Baltimore, Md.

BRADFORD, Ward A., Met. Eng.
John A. Roebling's Sons Co.
Trenton, N. J.

BRASTER, William A., Sales
Niles Steel Prod. Div.
Niles, Ohio

BRATTON, W. J.
Bronson & Bratton, Inc.
Chicago, Ill.

BREEN, Albert R., Factory Rep.
Acrometal Products Inc.
Chicago, Ill.

BREIDINGER, William C., Prod. Mgr.
R. H. Miller Company, Inc.
Homer, N. Y.

BRIGGS, Clifford E., Master Craftsman
Sylvania Electric Products Inc.
Warren, Pa.

BRONSON, W. D.,
Bronson & Bratton, Inc.
Chicago, Ill.

BROWN, Harry Arthur, Combustion Eng.
Bethlehem Steel Co.
Lebanon, Pa.

BRUESTLE, C. O., Dir. Res.
Syncro Machine Co.
Perth Amboy, N. J.

BUCHANAN, D. D., Mgr. of Operations
Republic Steel Corporation
Union Drawn Div.
Massillon, Ohio

BUREAU, A. A., Material Handling & Packing Eng.
Western Electric Company
Hawthorne Station
Chicago, Ill.

BURKHARDT, Gardner, Gen. Foreman
John A. Roebling's Sons Company
Trenton, N. J.

BURNS, Richard H., Res. Eng.
Indiana Steel & Wire Company
Muncie, Ind.

BURSCH, D. S., Industrial Eng.
International Standard Electric Corp.
67 Broad Street
New York, N. Y.

BUSCHMAN, Francis X., Mech. Eng.
Western Electric Company
Baltimore, Md.

BUSH, Col. George P., U .S. Army, Retired
65 Beech Ave.
Bethesda, Md.

CAMPBELL, J. W., Supt.
Wickwire Spencer Steel Co.
Buffalo, N. Y.

CARLSON, J. O., Supt.
Canadian Steel Corporation, Ltd.
Ojibway, Ontario, Canada

CARPENTER, C. H., Sales Eng.
Lee Wilson Engineering Co., Inc.
20005 West Lake Road
Cleveland, Ohio

CARTER, Joseph R., V. P.-Gen. Mgr.
Johnson Steel & Wire Co.
Worcester, Mass.

CASSIDY, L. James
Colorado Fuel & Iron Corp.
99 Beatrice Ave.
Buffalo, N. Y.

CHAMBERS, L. E., Mgr.
Chapat Eng. & Sales
Hamilton, Canada

CLARK, A. R., Prop.
Vascarb Die Company
Hamilton, Ontario, Canada

CLARK, E. W., Con. Eng.
Syncro Machine Company
611 Sayre Avenue
Perth Amboy, N. J.

CLAYTON, Erith T., Pres.
The Tainton Company
3100 Elm Avenue
Buffalo, N. Y.

COGAN, J. E., Eastern Repr.
National Machinery Company
983 Main Street
Hartford, Conn.

COOPRIDER, Carl A., Dept. Supt.
Continental Steel Corp.
Kokomo, Indiana

CORBETT, Robert L., Sales Engr.
Lee Wilson Engineering Co.
Cleveland, Ohio

CORSON, John H., Eng.
Bethlehem Steel Company
Williamsport, Pa.

COSGROVE, MARTIN, Pur. & Gen. Mgr.
Cosgrove Wire Cloth Co.
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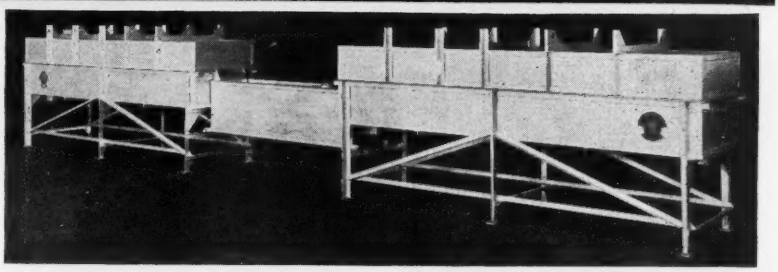

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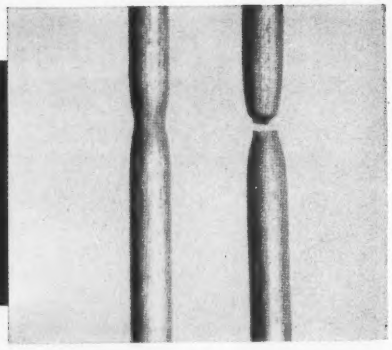

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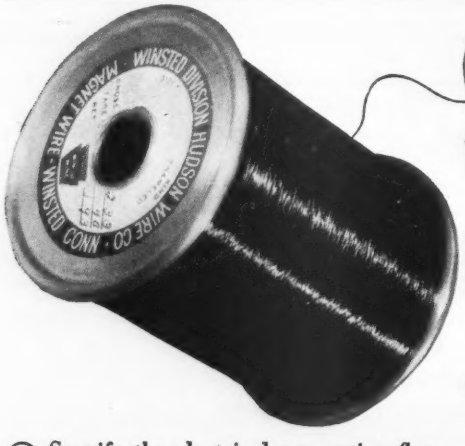

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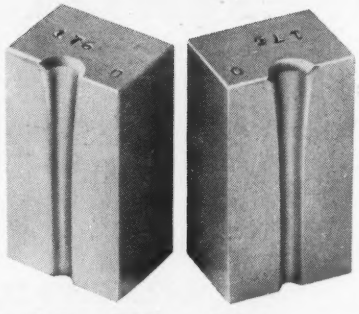

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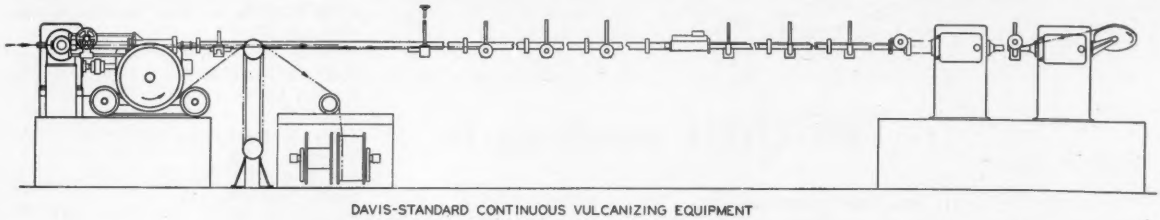

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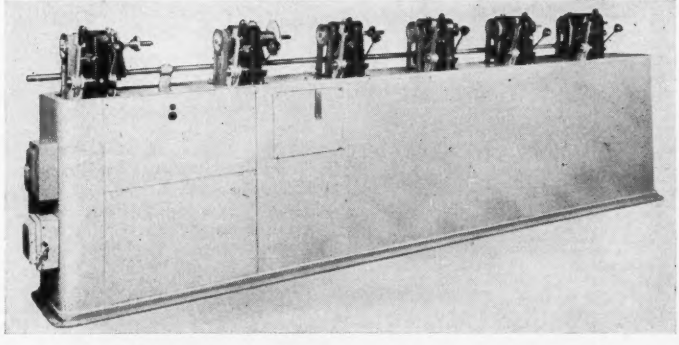

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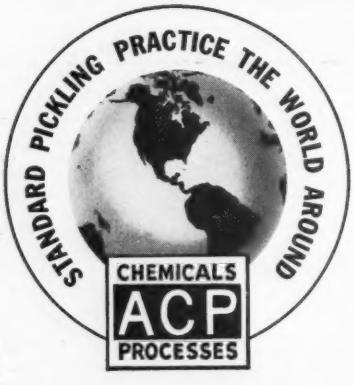

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SAN FRANCISCO, CAL.,

Friday, June 15, 1951

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There will be a plant visit to the wire mills of the Columbia Steel Co. at Pittsburg, Cal., a paper on "Woven Wire Cloth" by Karl H. Baessler, California Wire Cloth Corp., and a special exhibit on wire cloth set up for those who attend. Other features are being arranged, which will be announced soon.

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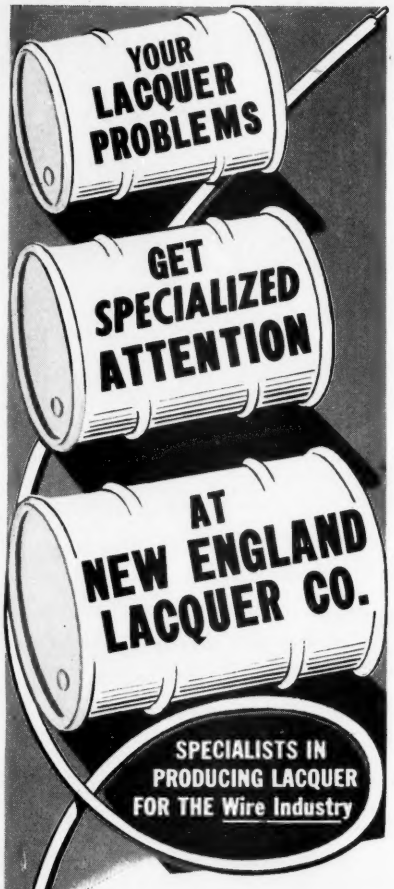
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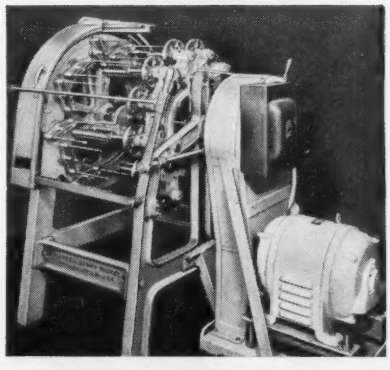

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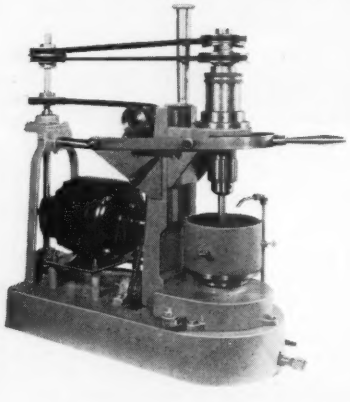

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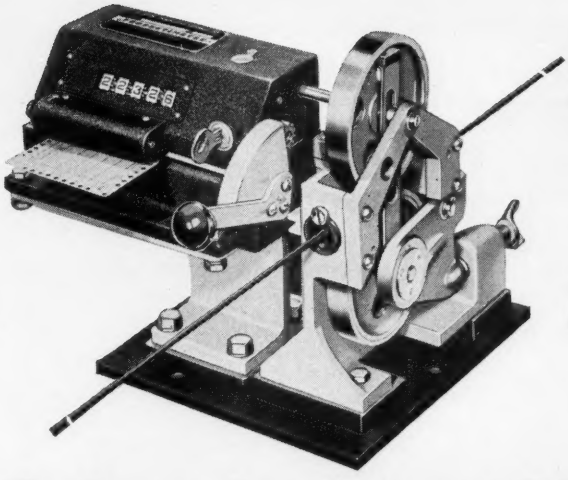

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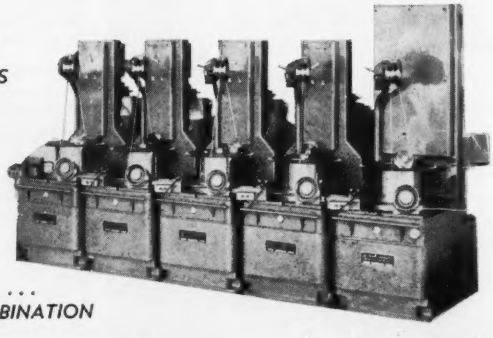

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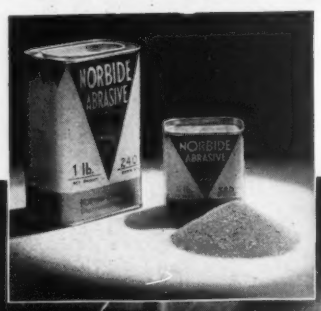

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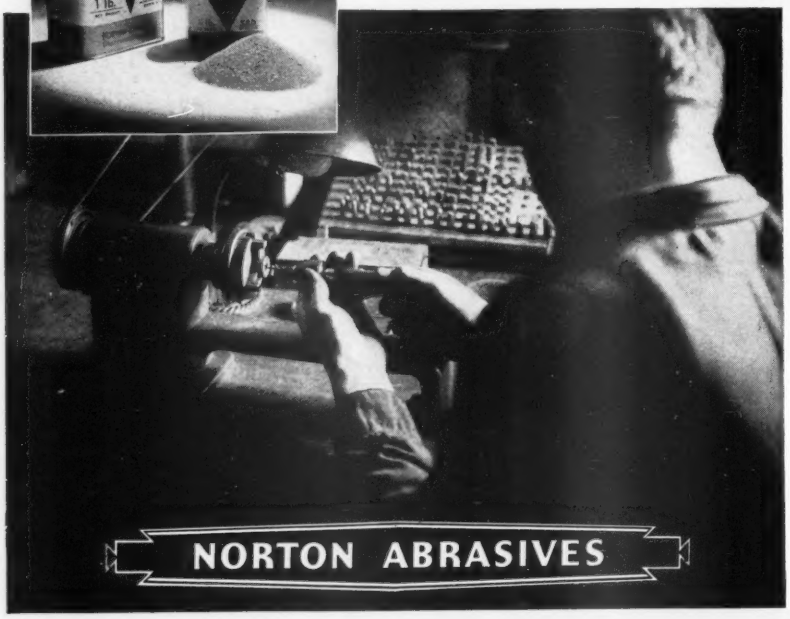

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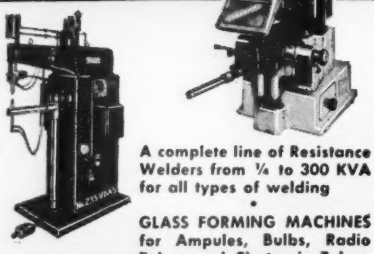

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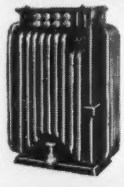

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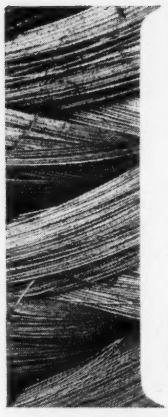

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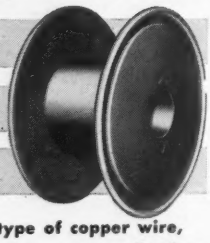

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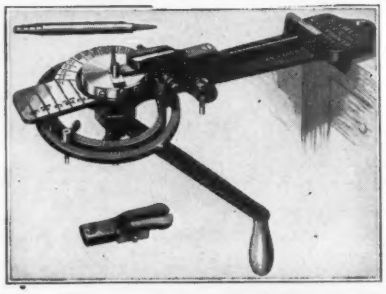

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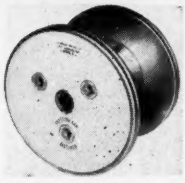

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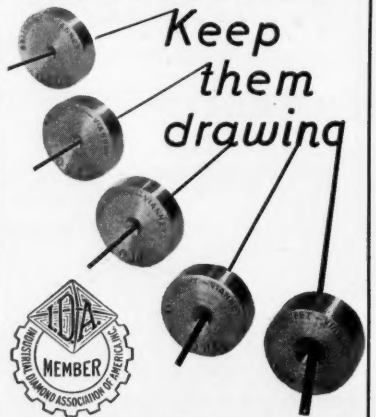

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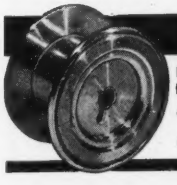
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Among the findings on cold extrusion now being released is the discovery of an additional lubricating step that materially increases the efficiency of this process.

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WIRE & WIRE PRODUCTS

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One (1) 4 block ditto
One (1) Fidelity 2 head double end screw traverse spooling machine #11413, each unit with four 7/16" removable spindles—equipped with 6 driving collars for wood spools ¼ to 1# of wire, 2 independent heads for 12 small spools with 1⅝" traverse or 8 large spools. Automatic measuring on each unit.
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One (1) Superior wire pointer.
Three (3) Fig. 674-5 oil filters—Bowser, Inc., Ft. Wayne, Indiana, with three 0 to 100# pressures gauges for filtering dig. oil.
Six (6) 5 Draft continuous flat bed wire drawing machines for drawing 12 to 20 gauge wire.

THE SENECA WIRE & MFG. CO.
FOSTORIA, OHIO

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ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Machy. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy., Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp, The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
American Steel & Wire Company, Cleveland, Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
(See Cleaners—Metal)

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Houghton, E. F., Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Metal & Thermit Corp., New York, N. Y.
Oakite Products, Inc., New York, N. Y.
The Parkin Chemical Company, Pittsburgh, Pa.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Holden, A. F., Company, The, New Haven, Conn. and Detroit, Mich.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, O.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Techema Co., The, Toronto, Canada

COMPOUNDS—Diamond
Eastern Carbide Corp., New Rochelle, N. Y.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Magnus Chemical Co., Garwood, N. J.

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Shell Oil Company, New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Shell Oil Company, New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CORROSION PREVENTIVES
Angier Corporation, The, Framingham, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Diamond Distributors, Inc., New York, N. Y.
Diamond Tool Research Co., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Division, Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Claire Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING
Diamond Tool Research Co., New York, N. Y.
National Research Company, St. Claire Shores, Mich.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Diamond Tool Research Co., New York, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide
(See Dies—Tungsten Carbide)

DIES—Cold Heading
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio.
Vascoloy-Ramet Corp., No. Chicago, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
American Carbide Die Company, Union City, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Metal Carbides Corporation, Youngstown, Ohio.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hartley Tool & Die Co., Thomaston, Conn.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
American Carbide Die Company, Union City, N. J.
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., New York, N. Y.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

DIES—Special Shapes, Etc.
American Carbide Die Company, Union City, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Ft. Wayne, Ind.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

DIES—Swaging
Murex, Ltd., Rainham, England.
Sjogren Tool and Machine Co., Inc., Auburn, Mass.

DIES—Tantalum Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tube Drawing
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIES—Tungsten Carbide
American Carbide Die Company, Union City, N. J.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartley Tool & Die Co., Thomaston, Conn.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Murex, Ltd., Rainham, England.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Wayne Wire Die Co., Hillside, N. J.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting
Copper—Leonard D. Walde, Seekonk, Mass.
Metal Fatigue—Fatigue of Materials Laboratory, Princeton, N. J.
Spring Design—Carlson Co., The, New York, N. Y.
Wire Mill—Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Company, The, Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Rockwell, W. S., Co., Fairfield, Conn.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, New Haven, Conn. and Detoit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Clevel nd, Ohio.
Drying Systems, Inc., Chicago, Ill.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.

FURNACES—Resistance Heating, Strand
Trauwood Engineering Co., The, Cleveland, Ohio.

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Holden, A. F., Co., The, New Haven, Conn. and Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Harper Electric Furnace Corp., Niagara Falls, N. Y.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING EQUIPMENT—
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HOOKS—Pickling & Liming
Bronze Die Casting Co., Pittsburgh, Pa.
Lewis Welding & Eng'g Corp., Bedford, Ohio.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Chemical Company, The, Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.
Owens Corning Fiberglas Corp., Toledo, O.
Twitchell, E. W., Philadelphia, Pa.

INSULATING MATERIALS—Paper—For Electric Wire Cable.
Merrimac Paper Co., New York, N. Y.
Twitchell, E. W., Philadelphia, Pa.

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Roos, Tool & Mfg. Co., Montclair, N. J.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Houghton, E. F. & Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Company, New York, N. Y.
Standard Industrial Compounds Co., Inc., Chicago, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

LUMBER—Wire Mill, for lagging and car blocking
North Anson Reel Co., North Anson, Maine.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Glader Machine Works, Chicago, Ill.
Wean Engineering Co., Cleveland, Ohio.

MACHINERY—Bead Wrapping
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Eisler Engineering Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New Englnd Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coilers
Boyd & Sons Manufacturing Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Cold Heading
(See Cold Headers)

MACHINERY—Copper Wire Drawing and Rolling
Aetna-Standard Engineering Co., Youngstown, Ohio.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Rubber Machinery Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool, Inc., New Haven, Conn.
National Mach'y Exch. (Used) New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Hartford Special Mchy. Co., Hartford, Conn.
Kagan-Dixon Industries, Inc.
Kelly Wire Die Corp., New York, N. Y.
Roos Tool & Mfg. Co., Montclair, N. J.
Wayne Wire Die Co., Hillside, N. J.
Wickman, A. C., Ltd., Coventry, England.

MACHINERY—Draw Benches
Aetna-Standard Engineering Co., Youngstown, Ohio.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Royle, John, & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Engineering Co., Youngstown, Ohio

MACHINERY—Pointing
Aetna-Standard Engineering Co., Youngstown, Ohio
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Hartford Special Mchy. Co., Hartford, Conn.
New England Butt Co., Providence, R. I.
Kagan-Dixon Industries, Inc., Rahway, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Mystic, Conn.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd & Sons Manufacturing Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Fidelity Machine Co., Inc., Philadelphia, Pa.
National Mach'y Exch. (Used), New York, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Spring Making
Lundahl Corp., Hartford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Norsholm Industries, Rochester, Michigan
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Forming
Wickman, A. C., Ltd., Coventry, England

MACHINERY—Strip Steel
Aetna-Standard Engineering Co., Youngstown, Ohio
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

WHERE TO BUY, Continued

MACHINERY—Testing Physical
Lundahl Corporation, Hartford, Conn.
Scott Testers, Inc., Providenec, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Marshall-Richards Machine Company, Inc., Trenton, N. J.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply, Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Winding Wire
Federal Manufacturing Co., Wallingford, Conn.
Standard Mill Supply, Pawtucket, R. I.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna-Standard Engineering Co., Youngstown, Ohio
Davis, R. L. Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Standard Machine Co., Mystic, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Youngstown, Ohio
American Insulating Mach'y Co., Phila., Pa.
Marshall-Richards Machine Company, Inc., Trenton, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Kilmer, M. D. & Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MACHINERY—Wrapping Straight Lengths and Tubing
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Wrapping Wire Coils
Angier Corporation, The, Framingham, Mass.
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc, Cortland, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.

OVENS—Dehydrogenizing
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S., Co., Fairfield, Conn.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Drying Systems, Inc., Chicago, Ill.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio.

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corporation, The, Framingh m, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corporation, The, Framingham, Mass.
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See Wind-up and Unwind Systems)

PHOSPHATE COATING CHEMICALS
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Bronze Die Casting Co., Pittsburgh, Pa.
Lewis Welding & Eng'g. Corp., Bedford, Ohio.
Youngstown Welding & Engineering Co., Youngstown, Ohio.

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

PNEUMATIC CYLINDERS—
Entwistle, Jas. L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

PRESSES—Hydraulic and Mechanical
Standard Machinery Co., Mystic, Conn.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry & Mach. Co., Trenton, N. J.
Siogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

REEL AND TENSION STANDS—
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Roll-a-Reel, Cincinnati, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Roll-a-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS & SPOOLS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS & SPOOLS—Plastic
Hubbard Spool Co., Chicago, Ill.

REELS & SPOOLS—Steel
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS & SPOOLS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
North Anson Reel Co., North Anson, Maine.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Clark, J. L., Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

WHERE TO BUY, Continued

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Company, Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Chicago, Ill.
Mason Can Company, East Providence, R. I.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
North Anson Reel Co., North Anson, Maine.
Proctor Reels, Proctorville, Vt.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
(See Ovens—Rod Bakers)

RODS—Aluminum
Kaiser Aluminum & Chemical Sales, Inc., Oakland, California

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio.

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's John A., Sons Co., Trenton, N. J
U. S. Steel Export Co., New York, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SALTS—Heat Treating, Descaling, etc.
Holden, A. F., Company, The, New Haven, Conn. and Detroit, Mich.
Houghton, E. F. & Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

SOAPS—Industrial and Wire Drawing
(See Compounds—Wire Drawing)

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Company, Cleveland, Ohio.
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

TANKS—Steel
Chemsteel Construction Co., Pittsburgh, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TIES—WIRE—
(See Wire Ties)

TINSEL—Cords, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL—Electric Resistance
(See: Tinsel—Electric Conductor)

TINSEL—Lame, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Silver and False Gold
(See: Tinsel—Electric Conductor)

TINSEL—Thread, Decorative
(See: Tinsel—Electric Conductor)

TINSEL—Wire
(See: Tinsel—Electric Conductor)

TOOLS—Spring Forming
Lundahl Corporation, Hartford, Conn.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, Jas. L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attlebore, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp. Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y Inc., Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
H. D. Kilmer Co., Cleveland, Ohio.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.
Malin & Co., Cleveland, Ohio.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewistown, Maine.
Montgomery Co., The, Windsor Locks, Conn.

WIRE Manufacturers
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specifications for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, N. Y.
American Steel & Wire Co., Cleveland-Chicago, New York.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Specialty Wire Co., Inc., Worcester, Mass.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Specialty Wire Co., Inc., Worcester, Mass.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Johnston Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting
Pittsburgh Cut Wire Co., Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.

WIRE TIES—(for cords, coils, etc.)
Hanscom, H. F. & Co., Providence, R. I.

WIRE—Tungsten
North American Philips Co., Inc., New York, N.Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Company, The, Division National Waterproof Papers, Inc., Newark, N.J

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
Glass Fibers, Inc., Waterville, Ohio.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE AND CORDAGE MACHINERY MANUFACTURERS

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PLANETARY STRANDERS. Three types, many sizes, for all duties, geared or ring backturn, main rotor shaft or roller support. "Shaftless" cradles.

RIGID FRAME STRANDERS "RH." Horizontal, overhung spindle designs. Ball bearing main rotor shaft support, no support rollers.

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CABLERS. Planetary and high speed "HH" designs.

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ARMORING MACHINES. Complete with planetary wire or metal tape heads.

JUTERS. 36 or 48 cop and to 6-inch cable passage.

SERVING HEADS. Concentric and eccentric, many designs, for threads, asbestos, etc.

TAPING HEADS. Many types and sizes. For metallic and non-metallic tapes. Eccentric, single and double-concentric. Patented uniform torque tape brake.

COMPOUND AND SATURATING TANKS. Many types and sizes.

CHALK, MICA AND OTHER POWDER APPLIERS. "Wet" and "Dry" types in a variety of designs and sizes.

CAPSTAN SECTIONS. Single tapered wheels to 10 foot dia. and double grooved types to 80 inch dia. for heaviest duty and highest haul pulls. Many sizes and designs.

LET-OFFS. Manual, mechanical, hydraulic and electric motor lift types and "Shaftless" designs to 120-inch 30-ton sizes.

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REWINDERS AND COILERS. All motorized, for warehouse and shipping use.

CAPSTAN TAKEUPS. Single and in multiples.

CONTINUOUS TAKEUPS. Double reel designs, constant tension, wide speed range to cover all Continuous Valcanizing and Plastic Extruding takeup requirements.

HEAVY DUTY TAKEUPS. "Shaftless" in many designs and sizes to 120"-50-ton. Mechanical lift, hydraulic lift, motorized lift, incline frame and other types. Line shaft, electric and hydraulic drives. Foot treadle, electric switch, pneumatic, hydraulic and mechanical controls.

TAKEUP TRANSMISSIONS. Heavy Duty, Type "D." Combines two-speed transmission, manual slack-takeup drive and multiple-disc-in-oil friction mechanism in one compact unit. Now available in three sizes.

AUTOMATIC TRAVERSES. Many sizes and arrangements. Wide lay range. Designs cover range from fine wire to 6" cable and wire rope. Fully automatic and disconnectible for manual operation. Suitable and widely used for replacement of inadequate mechanisms on older takeups.

VULCANIZERS. Cavity and Plate "Patch" units. Mechanically or pneumatically operated. Available with or without dies.

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REEL CRUTCHES. For turning very large and heavy reels. Widely used in warehouses, shipping rooms, by railroads, steamship lines and wherever reel handling is a problem. Available from stock.

REELS AND SPOOLS. Cast Steel and Fabricated designs for extremely heavy planetary and shipping use.

CABLE PLANT AND WIRE ROPE MILL EQUIPMENT. All manners of special and miscellaneous designs for general and special purpose work too numerous for listing but on which inquiries are invited.

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builds
Gas, Oil and
Electric Furnaces

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Because we build all types of batch and continuous furnaces—in sizes to meet any production requirement—gas-fired, oil-fired, and electrically heated—we can recommend *without prejudice* the type—the size—and the method of heating—that suits all phases of *your particular* problem best.

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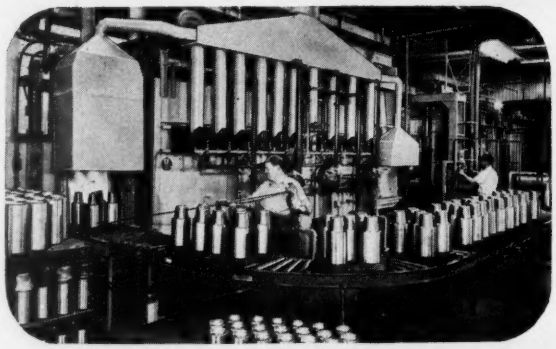
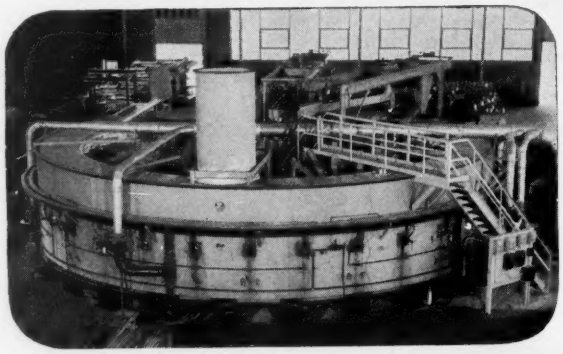
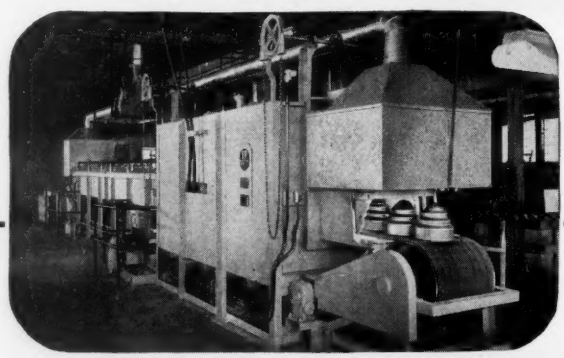


Gas-fired EF radiant tube continuous pusher-type furnace used for gas carburizing and other heat treating processes requiring several widely different cycles.



Oil-fired EF rotary furnace equipped with automatically controlled hydraulically operated charging and discharge mechanism —heats 35,000 lbs. of large billets per hour.



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